OPERATORS MANUAL AND PARTS CATALOG

FOR

Onan®

ELECTRIC GENERATING PLANTS

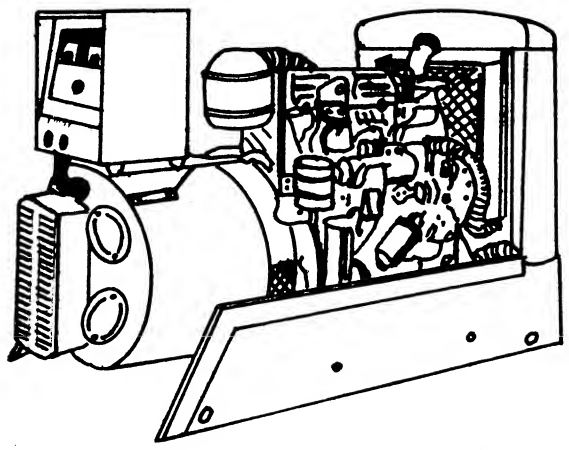
DEH
SERIES

Printed in U.S.A.

976—304

10A69

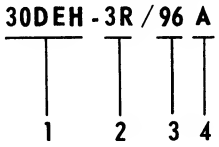
GENERAL INFORMATION



INTRODUCTION

This manual includes instructions on the installation, operation, troubleshooting and parts of the DEH electric generating plant. Identify your model by referring to the MODEL AND SPECIFICATION NO. as shown on the ONAN nameplate. Electrical characteristics are shown on the lower portion of the nameplate.

How to interpret MODEL and SPEC NO.



1. Factory code for SERIES identification.
2. Combines with number 1 to identify model. Indicates model, output voltage, method of starting:
   E-ELECTRIC starting
   R-REMOTE electric starting
3. Factory code for designating optional equipment.
4. Specification letter. (Advances when factory makes production modifications.)

If it is necessary to contact a dealer or the factory regarding the plant, always mention the complete Model, Spec No. and Serial No., as given on the ONAN nameplate. This nameplate information is necessary to properly identify your plant among the many types manufactured. Refer to the engine nameplate when requesting information from its manufacturer.

Electric plants are given a complete running test under various load conditions and thoroughly checked before leaving the factory. Inspect your plant closely for loose or missing parts and any damage which may have occurred in shipment. Tighten loose parts, replace missing parts and repair any damage before putting plant in operation.

TABLE OF CONTENTS

TITLE	PAGE
General Information	1
Specifications	2
Description	3
Installation	5
Operation	11
General Maintenance	14
AC Generator Maintenance	15
Parts Catalog	19

IMPORTANT!

RETURN WARRANTY CARD ATTACHED TO UNIT

SPECIFICATIONS

Dimensions (nominal)	
Height (inches)	43
Width (inches)	33
Length (inches)	67
Weight (Approximate in pounds)	1750
Number of Cylinders (Vertical in line)	4
Displacement (cu. in.)	242
Bore (inches)	4.125
Stroke (inches)	4.524
BHP at 1,800 rpm (nominal)	63
Compression Ratio (Diesel)	16.5 : 1
Manufacturer (engine)	Ford
Model	242DF-6005-A
Governor Regulation %	5
Nominal Battery Voltage	12
Battery Size	
SAE Group 1 H	Two
Amp/Hr SAE 20 hour Nominal	120
Solenoid Shift Starter	Yes
Engine Cooling Air (CFM at 1,800 rpm)	
City Water Cooling	400
Radiator Cooling	3780
Combustion Air (CFM at 1,800 rpm)	104
Alternator Cooling Air (CFM at 1,800 rpm)	350
Output Rated at Power Factor Load	0.8
Rating (Output in Watts)	
50 cycle AC intermittent service	25,000
50 cycle AC continuous service	20,000
60 cycle AC intermittent service	30,000
60 cycle AC continuous service	25,000
AC Voltage Regulation in ± %	2
AC Frequency Regulation in %	5
Revolving Field Alternator (4 pole)	Yes
Static Exciter (Magneciter)	Yes
Cooling System Capacity	
Radiator	16 qt.
Heat Exchanger	8.5 qt.
Engine Oil Capacity	8 qt.
Exhaust Connection (inches pipe thread)	2
Air Cleaner (Oil bath)	Yes
Closed Crankcase Breather System	No
RPM (60 cycle)	1,800
RPM (50 cycle)	1,500
Battery Charging Alternator	Yes

DESCRIPTION

GENERAL

An Onan electric generating plant of the DEH series is a complete unit consisting of a Diesel engine driving a self-excited AC generator, and such controls and accessories as specified by the purchaser.

ENGINE

The engine is a Ford basic model 242DF-6005 as described in the Ford manual. The specific engine used may have variations due to some of the optional equipment available as specified by the plant purchaser.

AC GENERATOR AND EXCITER

The complete generator consists of a 4 pole revolving field type alternator and a static exciter with a magnetic amplifier voltage regulator. The alternating current output is generated in the stator winding of the generator, attached to the rear portion of the engine. The alternator's rotating field, attached directly to the engine flywheel, turns at engine speed. The speed at which the rotor turns determines the current frequency, thus the 60 cycle plant must operate at approximately 1800 rpm and the 50 cycle plant at approximately 1500 rpm. The outer end of the rotor turns in a large ball bearing fitted into the end frame.

The exciter components are mounted inside a sheet metal enclosure attached to the alternator end frame. The exciter provides for almost constant AC output voltage over a wide range of load conditions. The static exciter is considerably smaller and lighter than a conventional DC generator and eliminates the necessity of an external voltage regulator, through the use of a magnetic amplifier. Some models are provided with a panel mounted rheostat control for voltage adjustment.

STANDARD ENGINE CONTROLS AND EQUIPMENT

Engine controls and equipment, which are mounted on the control box, contain components for starting, controlling and stopping the plant. Each of these controls is described below.

Run-Stop-Remote Switch: Starts and stops engine from either the plant or a remote location.

Cranking Limiter: Opens the starting circuit if engine does not start within approximately 45 seconds.

Oil Pressure Gauge: Indicates engine oil pressure. (Wired into a sending unit.)

Water Temperature Gauge: Indicates engine coolant temperature. (Wired into a sending unit.)

Emergency Latch Relay: Shuts engine off and protects from damage due to high water temperature, low oil pressure and engine overspeed. Utilizes a safety indicator light and an alarm terminal. When cause of trouble has been corrected a button must be manually reset before engine can be started again.

Automatic Overspeed Shutdown: If plant speed exceeds 2100 rpm this switch automatically actuates the latching relay and shuts down the plant.

High Water Temperature Cut-Out: If engine coolant temperature exceeds 215°F the latching relay energizes and shuts down the plant.

Low Oil Pressure Cut-Out: Allows oil pressure buildup while starting and shuts down the plant through the latching relay if oil pressure drops below 14 psi.

Battery Charging DC Alternator: A 12 volt DC, 35 amp output charges the two 6 volt batteries necessary for starting. Also utilizes a mounted voltage regulator.

Battery Charge Rate Ammeter: Indicates the battery charging current.

AC GENERATOR CONTROLS AND EQUIPMENT

The electrical instrument panel and equipment will vary according to the model and purchaser options. The following is a brief description of each of the controls and components which are standard items.

AC Voltmeter: Indicates the voltage of the AC output.

AC Ammeter: Indicates load current connected to the generator circuit. (Standard on Housed Models only.)

Voltage Adjusting Rheostat: Provides for approximately 5% plus or minus adjustment of the output voltage.

Meter Switch, Phase Selector: Selects the phase of the generator output which is indicated by the AC ammeter and voltmeter. (Standard on Housed Models only.)

Frequency Meter (Optional): Indicates the frequency of the output current in cycles per second. It can be used to check engine speed. (Each cycle per second equals 30 rpm engine speed.)

Running Time Meter: Registers the total number of hours to 1/10th, that the plant has run. Use it to keep a record of periodic servicing. (Standard on Housed Models only.)

OPTIONAL EQUIPMENT

The DEH electric generating plant is adaptable to automatic load transfer equipment, manual/automatic paralleling equipment and switchboards. Signal lights and alarms can be connected to warn the operator of improper operation. COOLING SYSTEM options include city water cooling (heat exchanger or standpipe), remote mounting radiators, radiator air duct adapters and flexible coolant lines. FUEL SYSTEM options include "day" tanks, electric fuel pumps, flexible and rigid fuel lines, fuel level indicators and underground fuel tanks.

Heavy duty batteries, battery racks, mufflers, governors and engine water jacket (tank) heaters are also available. Contact factory for any other options which may be available for your unit.

INSTALLATION

GENERAL

Installations must be considered individually. Use these instructions as a general guide. Meet regulations of local building codes, fire ordinances, etc., which may affect installation details.

Installation points to consider include:

1. Adequate engine cooling air.
2. Adequate generator cooling air.
3. Adequate fresh induction air.
4. Discharge of circulated air.
5. Discharge of exhaust gases.
6. Electrical connections.
7. Fuel connections.
8. Water connections.
9. Accessibility for operation.
10. Accessibility for servicing.
11. Level mounting surface.

LOCATION

Provide a location that is protected from the weather and is dry, clean, dust free and well ventilated. If practical, install inside a building for protection from extremes in weather conditions and preferably heated in cold weather.

MOUNTING (FIGURE 7)

Plants are mounted on a rigid skid base which provides proper support and adequate vibration damping. For convenience in draining crankcase oil and general servicing, plants can be mounted on raised pedestals (at least 6″ high). Extra vibration isolators are available and can be installed under the plant base. If mounting in a trailer or for other mobile applications, bolt securely in place. Extra support for the vehicle flooring may be necessary. Bolting down is optional for stationary installations.

NOTE: *When discussing front and rear of the DEH, engine end is considered the front, generator end the rear. Right and left sides are determined looking at engine (front) end.*

VENTILATION

Plants create considerable heat which must be removed by proper ventilation. Outdoor installations rely on natural air circulation but **mobile** and **indoor** installations need properly sized and positioned vents for the required air flow. See Specifications for the air required to operate with rated load under normal conditions at 1800 rpm.

Cooling air travels from the rear of the plant to the front end. Locate the room or compartment air inlet where most convenient, preferably to the rear of the plant. The inlet opening should be at least as large as the radiator area.

Engine heat is removed by a pusher fan which blows cooling air out through the front of the radiator. Locate the cooling air outlet directly in front of the radiator and as close as is practical. Make the opening size at least as large as the radiator area. Use duct of canvas or sheet metal between the radiator and the air outlet opening. The duct will prevent recirculation of heated air.

Provide a means of restricting the air flow in cold weather to keep the room or compartment temperature at a normal point.

On city water cooled plants the conventional radiator is not used. A constantly changing water flow cools the engine. Ventilation is seldom a problem, but sufficient air movement and fresh air must be available to properly cool the generator and support combustion in the engine. For small compartments, install a duct of equal or larger area to remove the heated air from the generator air outlet to the outside atmosphere. Limit bends and use radius type elbows where needed. A larger, well ventilated compartment or room does not require a hot air duct.

Installations made in a small room may require installation of an auxiliary fan (connected to operate only when the plant is running) of sufficient size to assure proper air circulation.

CITY WATER COOLING

An optional method of engine cooling, in place of the conventional radiator and fan, uses a constant pressurized water supply. This we refer to as CITY WATER COOLING. There are two varieties of city water cooling: the HEAT EXCHANGER SYSTEM and the STANDPIPE SYSTEM.

The HEAT EXCHANGER provides for a "closed" engine cooling system. Engine coolant flows through a tubed chamber, keeping the coolant separate from the cool "raw" water supply. The coolant chamber must be filled for operation, as for a radiator cooled plant.

The STANDPIPE SYSTEM uses a mixing or tempering tank. Cooling water that circulates through the engine mixes with a source of cool "raw" water. The "raw"

water supply must be free of scale forming lime or other impurities.

On both systems use flexible pipe for connecting water supply and outlet flow pipes to engine. Pipe the outlet flow to a convenient drain. Install an electric solenoid valve and a rate of flow valve in the water supply line. The electric solenoid valve opens and allows water flow through the system only when the plant operates. The rate of flow valve, either automatic or manual, provides for the proper flow rate to the engine. The minimum flow rate is indicated in Tables 1 and 2. Adjust the flow to maintain water temperature between 165° and 195° while viewing the water temperature gauge.

TABLE 1
MINIMUM COOLANT FLOW, HEAT EXCHANGER

ELECTRICAL LOAD	IF INLET WATER TEMP. IS:	THE MINIMUM FLOW (GAL/MIN) IS APPROX:
30 KW	40°	9
	60°	11
	80°	13

TABLE 2
MINIMUM COOLANT FLOW, STANDPIPE

ELECTRICAL LOAD	IF INLET WATER TEMP. IS:	THE MINIMUM FLOW (GAL/MIN) IS APPROX:
30 KW	40°	1.49
	60°	1.7
	80°	2.1

IMPORTANT: *Before filling cooling system, check all hardware for security. This includes hose clamps, cap screws, fittings and connections. Use flexible coolant lines when using with heat exchanger, standpipe or remote mounting radiator.*

EXHAUST

Pipe exhaust gases outside any enclosure (Figure 7). Use pipe at least as large as the 2″ pipe size outlet of the engine. Increase the pipe diameter one pipe size for each additional 10′ in length until increased three sizes. Use a flexible connection at the engine exhaust manifold. Provide adequate support for the piping. Pipe fittings cause a resistance to the flow of exhaust gases and can result in a loss of engine power. Use sweeping elbows in preference to standard pipe elbows and keep the number of turns to a minimum. If the exhaust line runs upward at any point, install a vapor or condensation trap at the low point, with a provision for periodic draining. Shield or insulate the line if there is any danger of personnel contact. If the line passes close to a combustible wall or partition, allow at least 4″ clearance. Install a suitable muffler.

WARNING *Exhaust gases are deadly poison.*

FUEL CONNECTIONS

Check local regulations governing the installation of a fuel supply tank.

NOTE: *In any Diesel engine installation, fuel system cleanliness is of utmost importance. Make every effort to prevent moisture or foreign matter from entering the system.*

The maximum fuel lift without any horizontal run should not exceed 6′. The horizontal run, if the supply tank is level with the fuel pump, should not exceed 12-1/2′. Use 1/2″ tubing for the supply line from the fuel tank and 3/8″ tubing for the nozzle overflow return line. Use a flexible section to connect the lines to the plant.

DAY TANK

Engines may be equipped with an optional day tank. A float operated switch controls the electric fuel pump (not included with day tank) to maintain the correct fuel level to assure a constant source of fuel. Do not mount the tank on the plant. Mount the tank on a vibration free support below the engine fuel return line. The tank overflow line to supply tank is optional, consult local regulations. Refer to the installation instructions included with the tank.

Use proper adapter fittings for line connections to the engine; the fuel inlet and the injector nozzle fuel return connection are threaded for a 1/8″ pipe fitting. Be sure there is no possibility of an air leak in the supply line connections, which would prevent pumping of fuel.

BATTERY

Two 6 volt batteries are recommended. Note that each battery cable terminal clamp is stamped "P" (positive) or "N" (negative) for connection to the proper battery terminal post. Connect positive to the large terminal of the start solenoid on the starter. Connect negative to a convenient ground point on the engine. Service the batteries as necessary.

Infrequent plant use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the plant. A separate trickle charger should be connected if installing a load transfer switch that has no built-in charge circuit. Onan load transfer controls include such a battery charging circuit.

REMOTE CONTROL CONNECTIONS

Starting and stopping is through a 2 wire electrical system. To extend this control to one or several remote locations, a 3 place terminal block is provided in the plant control box. The terminal block is marked REMOTE, B+ and GND. If a load transfer or an automatic control is used, follow the instructions supplied with the control. If a SPST manual switch is used, connect the wires and mount the switch so the engine will run when the switch handle is up; the

same as an ordinary light switch. The size wire to use is determined by the plant-to-control distance. Use #18 wire up to 900 feet (Figure 1).

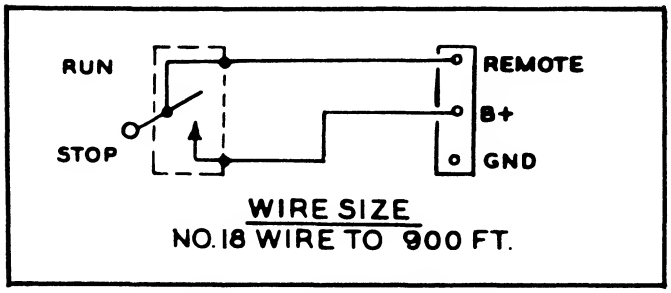


FIGURE 1. REMOTE STARTING

CONNECTING LOAD WIRES

Most local regulations require that wiring connections be made by a licensed electrician and that the installation be inspected and approved before operation. All connections, wire size, etc. must conform to requirements of electrical codes in effect at the installation site.

If the installation is for standby service, a double throw transfer switch (Figure 2) must always be used. This switch (either manual or automatic) must be connected so that it is impossible for the normal source and generator current to be connected to the load at the same time. Instructions for connecting an automatic load transfer control are included with such equipment.

WARNING *Personnel connecting the generator and any such auxiliary equipment must be fully qualified and understand the problems of balancing the circuits, etc.*

Refer to the output control wiring diagram furnished. Each generator lead is marked according to the wiring diagram.

Make load wire connections to the generator according to the type of facilities provided. If large terminal posts are provided, make load wire connection directly to the posts. Some plants are "reconnectible" for different voltages and extra leads. These are preconnected according to the nameplate ratings.

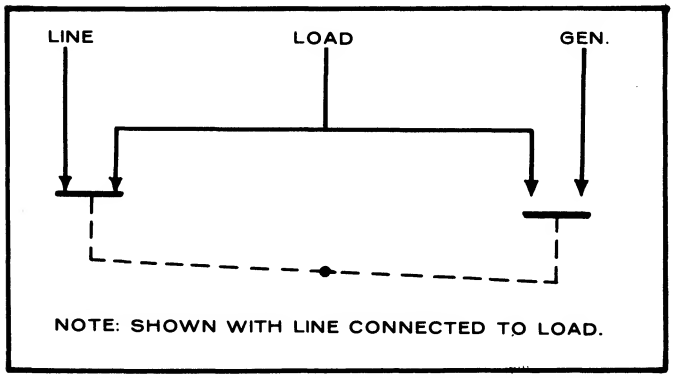


FIGURE 2. DOUBLE THROW TRANSFER SWITCH

IMPORTANT: *Before attempting to reconnect a generator – contact the Onan factory for required instrument changes, new wiring diagrams, new plant nameplate with proper specification number and voltage.*

3 Phase, 3 Wire Plant (Figure 3): No terminal is grounded. For 3 phase current, connect separate load wires to each plant terminal T1, T2 and T3.

If phase sequence is important, as with 3 phase motors, final connections can be postponed until a trail run is made. When the plant is installed for standby service, phase sequence of the normal line service and the generator output must be the same for proper load operation.

Obtain 1 phase current from any two plant terminals. These 1 phase circuits are thus available: T1 - T2, T1 - T3 and T2 - T3. The load connected to any 1 phase circuit must not be greater than 1/3 the rated capacity of the plant.

If using both 1 phase and 3 phase current at the same time, use care not to overload any one circuit. Subtract the amount of the 3 phase load from the rated capacity of the plant. Divide the remainder by 3 and this is the maximum load that can be connected to any one 1 phase circuit. For example, a 10,000 watt, 3 phase load is connected to a 25,000 watt plant. This leaves 15,000 watts available for 1 phase use – 5,000 watts on each circuit. Do not attempt to take all 15,000 watts in this example off one circuit, as overloading of the generator will result.

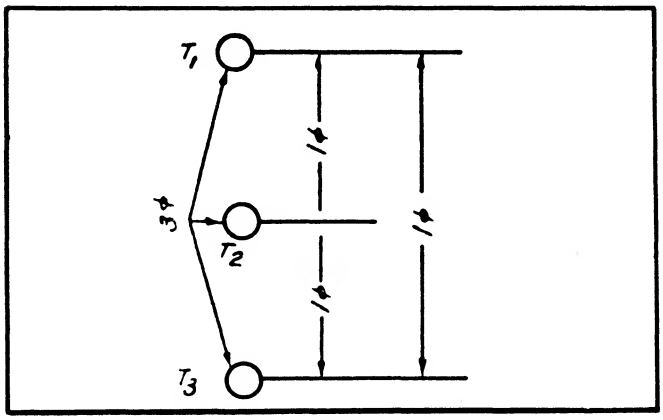


FIGURE 3. 3 PHASE, 3 WIRE

3 Phase, 4 Wire, Wye Connected Plant (Figure 4): The 3 phase, 4 wire plant produces 1 phase current of one voltage and 3 phase current of a different voltage. The 1 phase voltage is the lower voltage as noted on the plant nameplate, and the 3 phase voltage is the higher nameplate voltage.

The terminal marked T0 is grounded. For 1 phase current, connect the neutral (white) load wire to the T0 terminal. Connect the "hot" (black) load wire

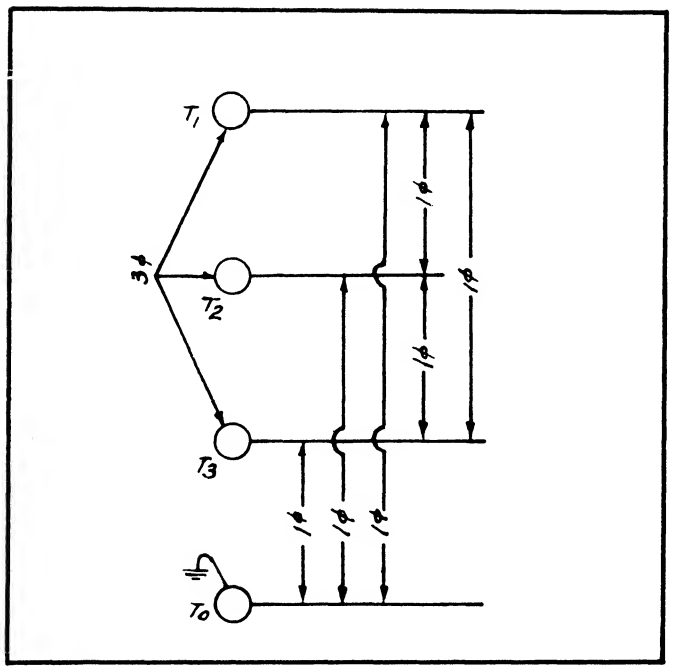


FIGURE 4. 3 PHASE, 4 WIRE "WYE"

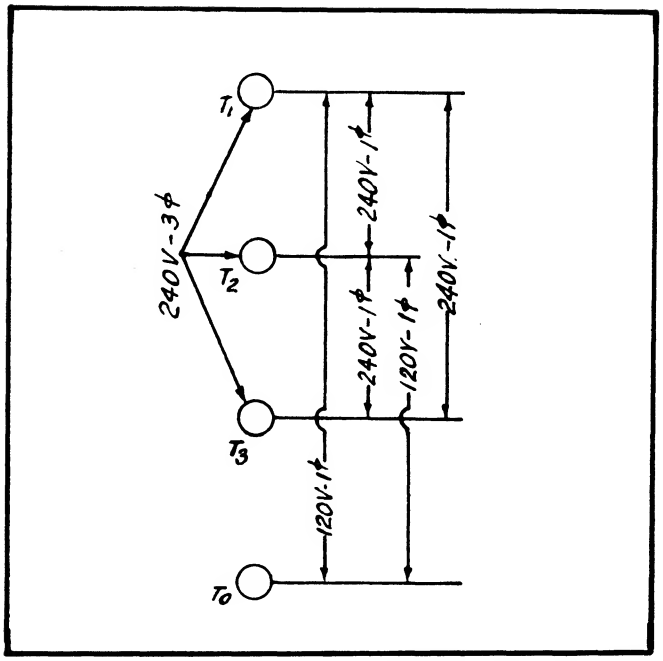


FIGURE 5. 120/240 VOLT, 3 PHASE "DELTA"

to any one of the other three terminals – T1, T2, or T3. Three separate 1 phase circuits are available, with not more than 1/3 the rated capacity of the plant from any one circuit.

For 3 phase current, connect separate load wires to each of the plant terminals T1, T2, and T3. If phase sequence is important, refer to the principles of connection as given for the 3 phase, 3 wire plant. One phase current is obtained between any two 3 phase terminals.

If using 1 phase and 3 phase current at the same time, use care to properly balance the 1 phase load.

120/240 Volt, 3 Phase, 4 Wire Delta Connected Plant (Figure 5): The 3 phase Delta connected plant is designed to supply 120 volt, 1 phase current and 240 volt, 3 phase current. For 1 phase operation, connect the three load wires to the three plant terminals T1, T2, and T3 – one wire to each terminal. For 3 phase operation the T0 terminal is not used.

For 120/240 volt, 1 phase, 3 wire operation, terminals T1 and T2 are the "hot" terminals. The T0 terminal is the neutral, which can be grounded if required. For 120 volt service, connect the "hot" (black) load wire to either the T1 or T2 terminal. Connect the neutral (white) wire to the T0 terminal. Two 120 volt circuits are available. Any combination of 1 phase and 3 phase loading can be used at the same time as long as no terminal current exceeds the NAMEPLATE rating of the generator. If no 3 phase output is used, usable 1 phase output is 2/3 of 3 phase KVA.

120/240 Volt, 1 Phase, 3 Wire Plant (Figure 6): Terminal post T2, T3 is the grounded (neutral) terminal. For 120 volt current, connect the "hot" load wire to either the T1 or T4 terminal. Connect the neutral load wire to the T2, T3 terminal. Two 120 volt circuits are thus available, with not more than 1/2 the rated capacity of the plant available on each circuit. Balance the load as closely as possible.

For 240 volt current, connect one load wire to terminal T1 and the second load wire to terminal T4. Terminal T2, T3 is not used for 240 volt service.

If using both 120 and 240 volt current at the same time, use care not to overload either circuit.

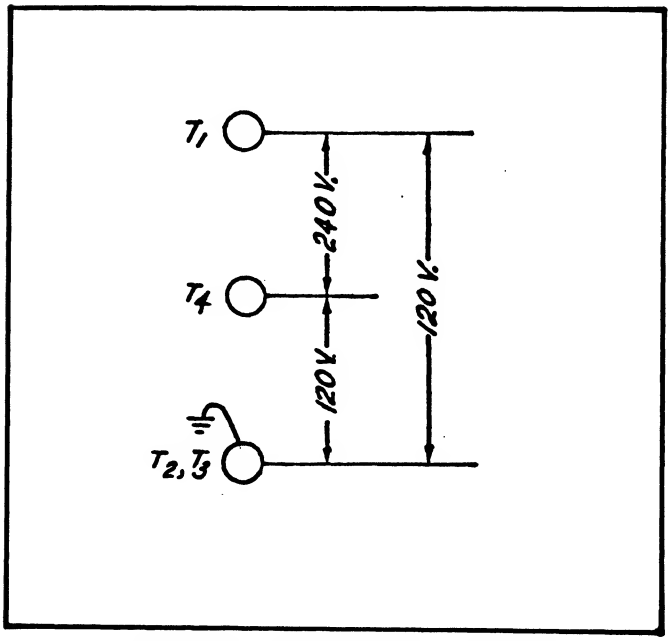


FIGURE 6. 120/240 VOLT, 1 PHASE

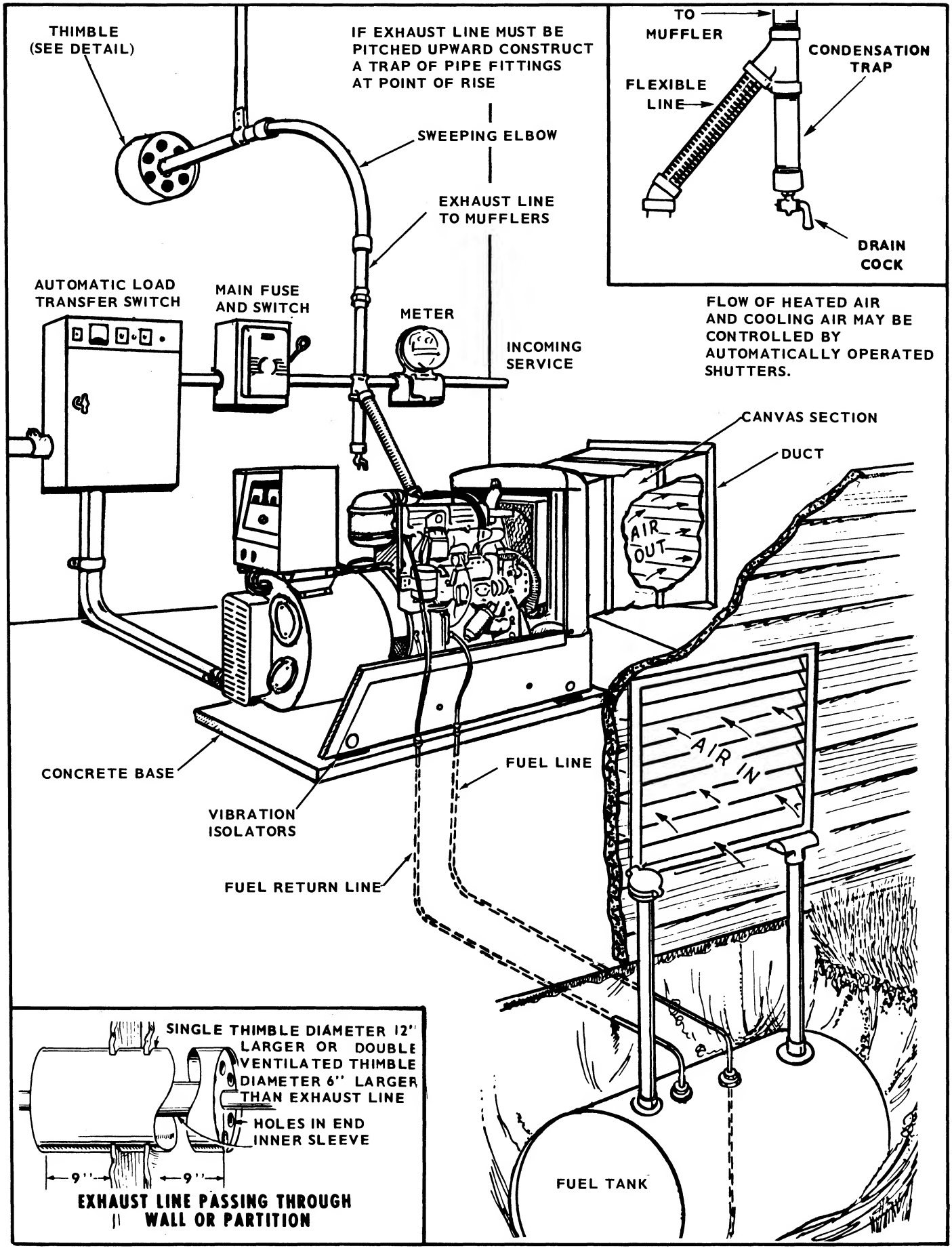


FIGURE 7. A TYPICAL INSTALLATION

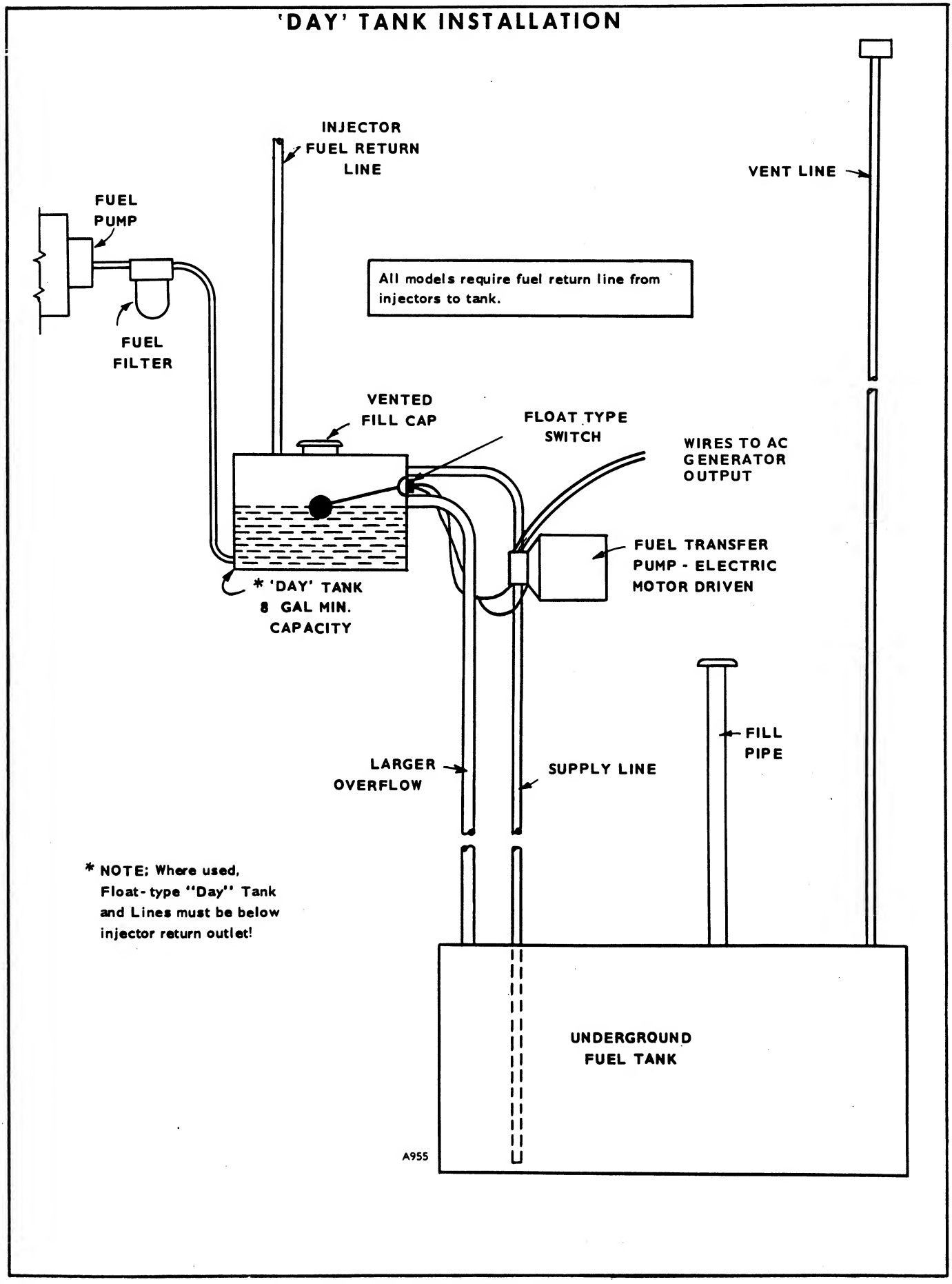


FIGURE 8. DAY TANK INSTALLATION

CRANKCASE OIL

Refer to the LUBRICATION section of the Ford engine manual for recommendations as to the SAE number of oil to use. Fill the crankcase with 8 quarts (U.S. measure) of good quality, heavy duty oil designated for "type DS" service.

GOVERNOR AND INJECTOR PUMP OIL

Fill the governor with engine oil until the oil starts to overflow from the oil level plug hole on the side of the governor. Do not overfill.

AIR CLEANER

Service the air cleaner with oil, filling to the level marked on the cleaner. Use the same SAE number oil as used in the crankcase. However, it is not necessary to use expensive heavy duty oil in the air cleaner. A straight non-detergent mineral oil is satisfactory.

RADIATOR

Fill the radiator with clean soft water. Use a good rust and scale inhibitor. If there is any danger of exposure to freezing temperatures, use a standard antifreeze in the recommended proportion. The approximate capacity of the cooling system is 16 U.S. quarts. On the initial run, check the level several times and add liquid as necessary to compensate for any air pockets which may have formed when filling.

FUEL

No. 2 Diesel fuel is recommended. Check with fuel supplier for assurance that fuel meets specifications.

BEFORE INITIAL START (FIGURE 9)

Before initial start, prime and bleed all air from the fuel system.

1. Ensure that there is sufficient fuel in the tank and that the fuel supply tap is turned on.
2. Open the bleed screw between the two secondary filters.
3. Operate the priming lever at the side of the engine fuel pump until a flow of fuel, free from air, is expelled from the bleed screw.
4. Close the bleed screw.
5. Open the two bleed screws on injection pump. Repeat step 3.
6. Close the bleed screws.

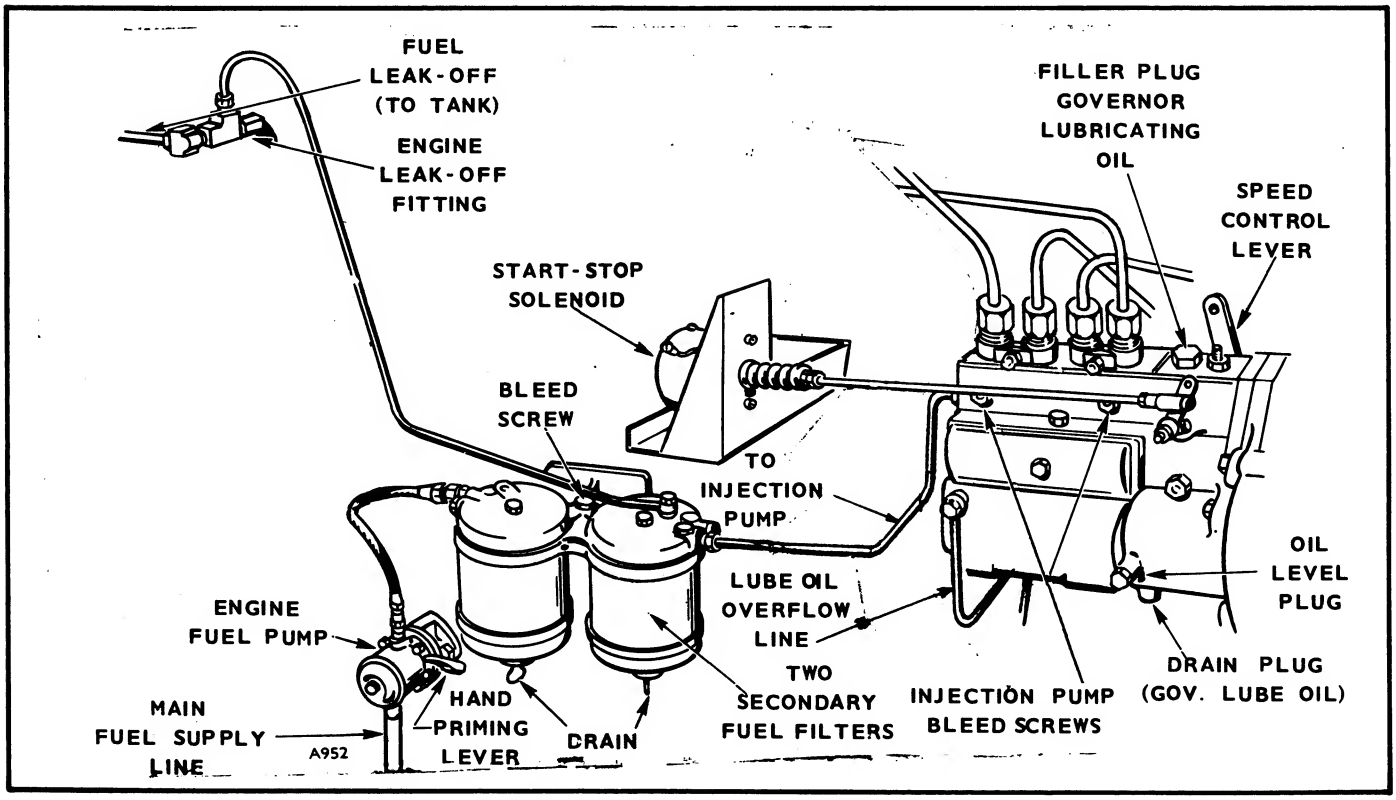


FIGURE 9. PRIMING FUEL SYSTEM

CAUTION *The engine oil and coolant were drained prior to shipping, and rust inhibiting oil applied to the cylinders. Before operating, fill crankcase with oil and cooling system with coolant.*

STARTING

To start, press the RUN-STOP switch to its RUN position, holding in contact to crank the engine. The engine should start with a few seconds of cranking. Investigate any failure to start – do not crank for more than 30 seconds at one time. If engine fails to crank, check that the cranking limiter switch is closed.

OPERATORS NOTE: *Always use all instruments provided with the unit to obtain the most satisfactory service from it.*

CHECKING OPERATION

As soon as the engine starts, always check the oil pressure. Normal oil pressure is approximately 40 psi at operating temperature.
The water temperature gauge indicates the coolant temperature during operation. Normal operating temperature is approximately 190°F.

The DC ammeter on the engine control panel indicates the battery charging current. An automatic regulator controls the charging rate, which will vary according to charge condition of the battery. Normal charge rate is 5 to 10 amperes when the plant first starts. The rate should fall to almost zero as the battery becomes fully charged.

BREAK-IN NOTE: *Run plant at 50% rated load for the first 1/2 hour after reaching operating temperature.*

WATER FLOW

If the plant is city water (pressure) cooled, but without the optional flow (Powers or Marsh) regulator, check the rate of water flow. At installation, an adjustable valve was connected in the water supply line. With the key provided, adjust the valve to provide a flow of water sufficient to keep the water temperature gauge reading within the range of 165°F to 195°F under full load (see Tables 1 and 2). Excessive water flow is wasteful and expensive – too little flow will cause a rise in coolant temperature and automatic shut down by the high temperature safety switch. To avoid unauthorized tampering after proper adjustment, remove and store the adjusting key.

STOPPING

If conditions permit, disconnect electrical load and allow the plant to run a few minutes at no load. This will allow the plant to cool off slightly, and may prevent an excessive temperature rise when the plant stops and ventilation ceases. Press the START-STOP switch to its STOP position to stop the plant.

LOW OIL PRESSURE SWITCH

In case of low engine oil pressure, the oil pressure switch acts through the emergency stop relay to stop the plant. After correcting the cause of the low oil pressure, press the reset button before attempting to restart the engine.

HIGH WATER TEMPERATURE

If the engine coolant temperature rises to a dangerously high point, a thermostatic switch actuates the stop circuit and stops the plant. Correct the condition that caused the high temperature. The coolant temperature must drop approximately 10°F before the plant can be started again. The high water temperature switch acts through the EMERGENCY STOP RELAY, and the PUSH TO RESET button must be pressed to restore normal operation.

VOLTAGE REGULATOR RHEOSTAT

On plants equipped with a voltage regulator rheostat, the rheostat provides for approximately 5% plus or minus adjustment of the output voltage. Turn clockwise to increase the voltage, counterclockwise to decrease the voltage.

BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90°F, such as in a boiler room. To lengthen battery life, dilute the electrolyte from its normal 1.275 specific gravity reading at full charge to a 1.225 reading. The cranking power is reduced slightly when the electrolyte is so diluted, but if the temperature is above 90°F, this should not be noticed. The lengthened battery life will be worth the effort.

1. Fully charge the battery.
2. With the battery still on charge, draw off all the electrolyte above the plates in each cell. DO NOT ATTEMPT TO POUR OFF! Use a hydrometer or filler bulb. Avoid skin or clothing contact with the electrolyte and dispose of it in a safe manner.
3. Refill each cell with distilled water, to normal level.
4. Continue charging for one hour at a 4 to 6 ampere rate.
5. Test each cell. If the specific gravity is still above 1.225, repeat steps 2, 3 and 4 until the reading is reduced to 1.225. Usually, repeating steps twice is sufficient.

NO LOAD OPERATION

Periods of no-load operation should be held to a minimum. After about four hours of continuous no-load operation, the injection nozzles can become fouled and require servicing. If it is necessary to keep the engine running for long periods of time when no electrical output is required, best engine performance will be obtained by connecting a "dummy" electrical load. Such a load could consist of heater elements, etc.

EXERCISE PERIOD

If the plant is used infrequently, such as in standby service, start and operate for at least 30 minutes once a week. This exercise period keeps engine parts lubricated and ensures easy emergency starts.

OUT-OF-SERVICE PROTECTION

Protect a plant that is to be out-of-service for more than 30 days as follows:

1. Run plant until thoroughly warm.
2. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
3. Remove each injector. Pour one ounce (two tablespoons) of rust inhibitor (or SAE #50 oil) into each cylinder. Install injector.
4. Service air cleaner as outlined in Ford manual.
5. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
6. Wipe entire unit. Coat parts susceptible to rust with a light film of grease or oil.
7. Disconnect battery and follow standard battery storage procedure.
8. Provide a suitable cover for the entire unit.

HIGH TEMPERATURES

1. See that nothing obstructs air flow to and from the plant.
2. Keep cooling system clean.
3. Use correct SAE No. oil for temperature conditions.

LOW TEMPERATURES

1. Use correct SAE No. oil for temperature conditions. Change oil only when engine is warm.
2. Use fresh fuel. Protect against moisture condensation.
3. Keep fuel system clean, and batteries in a well charged condition.
4. Partially restrict cool air flow but use care to avoid overheating.
5. Refer to Ford manual for additional information.
6. Connect water jacket (tank) heater when engine is not running.

DUST AND DIRT

1. Keep plant clean. Keep cooling system free of dirt, etc.
2. Service air cleaners frequently.
3. Change crankcase oil every 100 operating hours.
4. Keep oil and fuel in dust-tight containers.
5. Keep injector pump linkage clean.

HIGH ALTITUDE

Ratings apply to altitudes up to 1000 feet, standard cooling, normal ambients and with No. 2 Diesel fuel. Consult factory or nearest authorized Onan distributor for operating characteristics under other conditions.

GENERAL MAINTENANCE

GENERAL

Follow a definite schedule of inspection and servicing, based on operating hours. Use the running time meter (if so equipped) to keep a record of operation and servicing. Service periods outlined below are for normal service and operating conditions. For continuous duty, extreme temperature, etc., service more frequently. For infrequent use, light duty, etc., service periods can be lengthened accordingly.

ENGINE

Refer to the Ford engine manual for details and periodic maintenance.

AC GENERATOR

In addition to the engine service operations in the Ford manual, check the condition of the AC generator. Service and maintenance are outlined in the next chapter.

BATTERIES

Check the condition of the starting batteries at least every two weeks. See that connections are clean and tight. A light coating of grease or asphalt paint will retard corrosion at terminals. Keep the electrolyte at the proper level above the plates by adding distilled water.

CONNECTIONS (FUEL, EXHAUST, ETC.)

Operator should periodically make a complete visual inspection of the plant while running at rated load. Some of the things to check for are as follows:

1. Check all fuel and oil lines for possible leakage.
2. Inspect exhaust lines and mufflers for possible leakage and cracks.
3. Periodically drain moisture from condensation traps.
4. Inspect water lines and connections for leaks and security.
5. Inspect electrical wires for security.

ENGINE SPEED

Generator frequency output current is in direct ratio to the engine speed. Engine speed is controlled by the built-in governor of the fuel injection pump. The original factory governor setting should not be disturbed. However, in case of pump repair, the governor is easily reset.

1. See that the injection pump is properly timed to the engine. Refer to the Ford engine manual.
2. Refer to instructions in Ford manual for governor adjustment. Adjust engine speed to approximately 1800 rpm for 60 cycle operation and approximately 1500 rpm for 50 cycle operation. Use an accurate tachometer for determining engine speed settings, or a frequency meter connected to AC generator output terminals. Multiply frequency by 30 to obtain engine speed.

   EXAMPLE: 30 x 61 (cycles) equals 1830 rpm.

BATTERY CHARGING DC ALTERNATOR (FIGURE 10)

This information is presented for field use only. If a major repair is needed, contact your local authorized dealer.

Brush Assembly Removal:

1. Remove the three No. 10-24 screws which fasten voltage regulator to DC alternator. Remove regulator to gain access to phenolic cover, disconnecting leads as required.
2. Remove the two No. 8-32 screws on phenolic cover and lift out cover and gasket.
3. Pull brush assembly straight up and lift out.
4. For reassembly, reverse procedure.

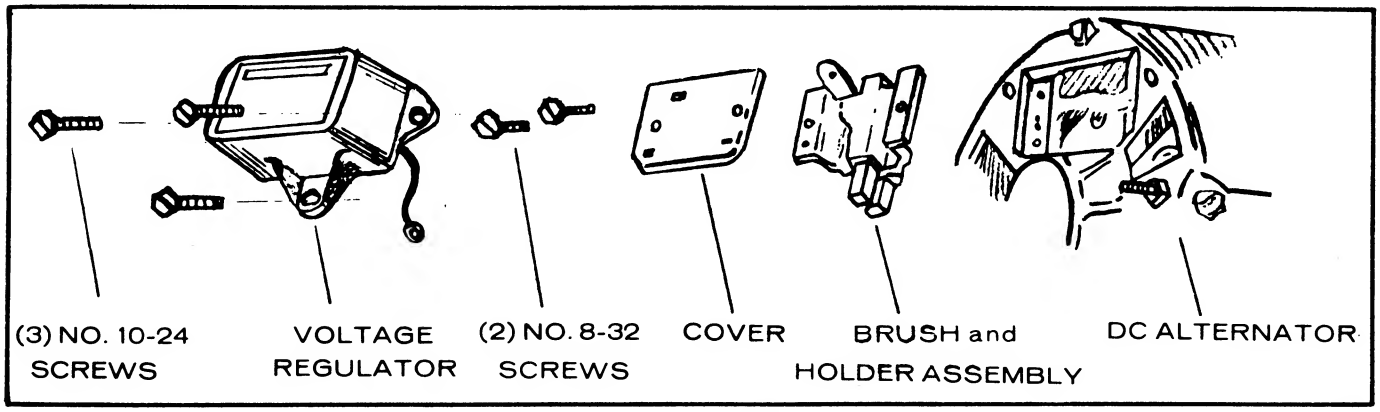


FIGURE 10. DC ALTERNATOR DISASSEMBLY

AC GENERATOR MAINTENANCE

GENERAL

AC generators normally require very little servicing. Periodic inspection, to coincide with engine oil changes, will assure good performance.

BRUSHES

To examine the brushes, brush springs and slip rings, remove the inspection and ventilating covers from the end bell openings. Keep the end bell, brush rig, etc., free of dust and dirt.

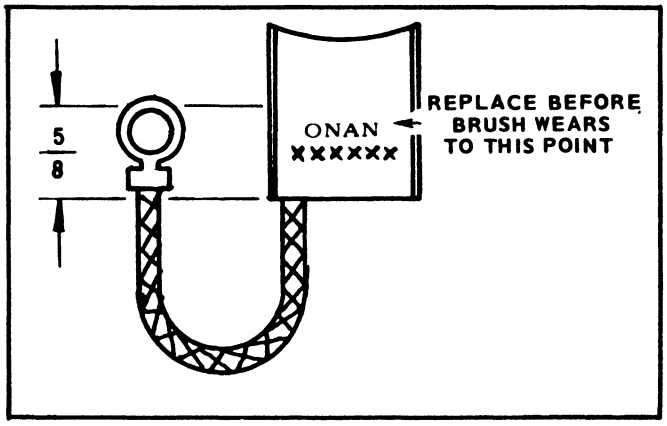


FIGURE 11. BRUSH REPLACEMENT

Replace brushes when worn to approximately 5/8" long, or when the brush is wearing into the stamped Onan name. Do not attempt to remove the brush without first removing its spring and brackets as shown. Never bend a spring back over its bracket – doing so will put a kink in it and require its replacement. Do not use a substitute brush that may look identical but may have entirely different electrical characteristics. Be sure the brush is installed so that the short side of its taper is toward the spring and its bracket (Figure 12).

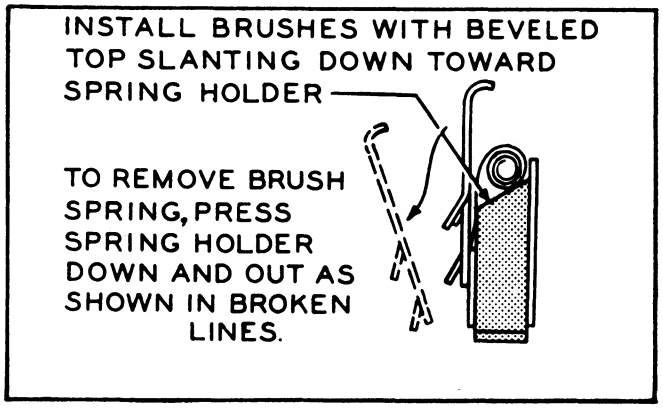


FIGURE 12. BRUSH REMOVAL

GENERATOR BEARING

The generator bearing is double-sealed and prelubricated. Inspect the bearing for rotation every 1000 hours while the plant is running.

If plant is used for "prime power", replace the bearing every 10,000 hours or two years. If the plant is used for "standby", replace the bearing every five years. Deterioration of the bearing grease, due to oxidation, makes this replacement necessary.

EXCITER

The exciter contains no moving parts. Occasionally blow out dust, etc. with clean, filtered air. Check thoroughly to assure that all components are mechanically secure and that all electrical connections are tight.

GENERATOR TESTS

If the generator does not function properly, a few simple tests with the plant not running may isolate the case.

1. Temporarily disconnect the leads from exciter terminals E1, E2, AF1 and AF2. Check the exciter wiring diagram for input voltage to the exciter, and temporarily connect an alternate source (such as commercial line) of AC power with the same voltage rating to exciter terminals E1 and E2.

   Check the voltage across terminals AF1 (+) and AF2 (–). If there is no DC voltage, the exciter is not functioning.

2. If DC voltage at terminals AF1 and AF2 is 25 volts or higher, check the alternator for a grounded or open circuit, etc.

3. No terminal of the exciter should show a grounded circuit.

CHECKING STATIC EXCITER

Troubles on the following page are listed in advancing order, from no output voltage to rated but fluctuating output voltage. The relationship between trouble and cause is not always consistent from model to model, so the following information must be used as a guide, not an absolute rule. The column entitled "step" indicates the step for testing a standard component. When the word "None" appears in that column, all the information needed to complete the check is given in the column headed "Corrective Action". Use a multimeter to check continuity, voltage and resistance as indicated in the tests.

EXCITER TROUBLESHOOTING CHART

NATURE OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION	STEP
Generator will not build up voltage.	Circuit breaker in "off" or "tripped" position.	Reset and close breaker.	None
	Open in circuit breaker.	Stop plant and check breaker continuity.	None
	No AC power to Magneciter.	Check AC voltage at E1-E2 with the plant operating. Voltage should be 5 percent of the rated voltage. If not, check continuity from E1-E2 back to generator.	None
	Partial loss of residual in rotor.	With plant operating, jumper from E2 to heat sink of field rectifier Z until voltage begins to build up. Then remove.	None
	Pair of field rectifiers open (either W and Z or X and Y).	Test rectifiers and replace if defective.	(1)
	Both field rectifiers X and Y shorted.	Test rectifiers and replace if defective.	(1)
Output voltage slow to build up. Circuit breaker opens in about 5 seconds.	Either field rectifier X or Y shorted.	Test rectifiers and replace if defective.	(1)
Output voltage slow to build up and 5 percent below rated voltage after build up. Voltage regulation poor.	Either field rectifier W or Z shorted.	Test rectifiers and replace if defective.	(1)
Output voltage slow to build up and higher than rated voltage after build up.	Open circuit in one or more control rectifier.	Test rectifiers and replace if defective. Check soldered connections to rectifiers.	(1)
Output voltage slow to build up and 10 to 20 percent above rated voltage after build up.	Open in one field rectifier.	Test rectifiers and replace if defective.	(1)
	Open circuit in gate winding G1-G2 of reactor A or B.	If field rectifiers Y and Z check okay, check continuities of gate windings G1-G2.	(2)
Output voltage builds up normally but less than rated voltage after build up.	Shorted winding in control reactor.	Test control reactor and replace if defective.	(3)
Output voltage builds up normally with slightly less than rated voltage at no load and low voltage at full load.	Compound winding S1-S2 installed backward or has open circuit.	Check wiring diagram for polarity of compound windings through reactors A and B and test for continuity.	None
Output voltage builds up normally but 20 percent above rated voltage after build up. Voltage regulation poor.	Compound winding S1-S2 installed backward through one reactor (A or B).	Check wiring diagram for polarity of compound winding through reactor A or B.	None
Output voltage builds up normally but is 25 percent above rated voltage after build up.	Open circuit in control rectifier bridge.	Check continuity from the junction of control rectifiers Z and Y to the junction of control rectifiers X and W.	None
Output voltage builds up normally but 125 to 150 percent above rated voltage after build up.	Shorted turn in gate winding G1-G2 of reactor A or B.	Test reactors A and B for shorted turns and replace if defective.	(2)
Output voltage builds up normally but 150 to 200 percent above rated voltage after build up. No regulation possible.	Control winding C1-C2 or reactor A or B polarized incorrectly.	Check circuit connections of both reactors A and B.	None
	Shorted turn in control winding C1-C2 or reactor A or B.	Test reactors A and B for shorted turn and replace if defective.	(2)
	Open in control circuit.	Check continuity from E1-E2 through control circuit.	None
Generator voltage fluctuating while engine running at constant speed.	Incorrect setting on stabilizing resistor.	Check resistance and reset.	(4)

For corrective steps, see following page.

STEP 1 – CHECKING RECTIFIERS

Disconnect one lead from, or remove each rectifier for its individual test.

CAUTION *Note carefully the direction of mounting of any rectifier removed. It must be remounted in its original direction.*

a. Connect the ohmmeter across the rectifier contacts and observe the meter reading.
b. Reverse the connections and compare the new reading with the first reading.
c. If one reading is considerably higher than the other reading, the rectifier can be considered satisfactory. However, if both readings are low, or if both indicate an "open" circuit, replace the rectifier with a new identical part.

STEP 2 – CHECKING REACTORS "A" and "B"

CAUTION *Use an accurate ohmmeter when checking resistance values. Resistance readings between "G" and "G2" cannot be read with accuracy on the multimeter.*

a. Set the resistance range selector on the meter to the resistance range.
b. Isolate one gate winding by disconnecting either end of gate winding G1-G2 from its point of connection; for example, disconnect G1 at E2. Measure the resistance in the gate winding across G1-G2. Should be .75 ohms.
c. Isolate one control winding by disconnecting either lead C1 or C2 from the terminal block. Measure the resistance in the control winding across C1-C2. Should be 9.0 ohms.
d. Connect one meter lead to the disconnected gate winding lead and the other meter lead to the disconnected control winding lead and check for continuity.

Results:

1. REACTOR IS SERVICABLE if resistance is within 20 percent either way of the value listed and there is no continuity between the control and gate windings.
2. REACTOR IS DEFECTIVE if there is an open circuit in either the gate or the control windings. Continuity between the gate and the control windings is also an indication of a defective reactor. In either case, the reactor should be replaced.

STEP 3 – CHECKING CONTROL REACTOR

a. Isolate the control reactor by disconnecting common lead "C" from its point of connection and carefully measure the resistance from this lead to the number lead on the control reactor. Should be 18.0 ohms.

Results:

1. CONTROL REACTOR IS SERVICEABLE if resistance is within 10 percent of the value specified.
2. CONTROL REACTOR IS DEFECTIVE if no continuity is indicated between the common lead "C" and the numbered lead, indicating the presence of an open circuit.

STEP 4 – CHECKING RESISTORS

The resistors must be checked with a multimeter adjusted to appropriate range of resistances. See wiring diagram for correct values.

Results:

1. RESISTOR IS SERVICEABLE if the measured resistance falls within 20 percent of the value specified in the wiring diagram.
2. RESISTOR IS DEFECTIVE if there is indication of continuity through the resistor. If the measured resistance exceeds the percent limits either way, the stabilizing resistor can be adjusted to bring the resistance within the required limits.

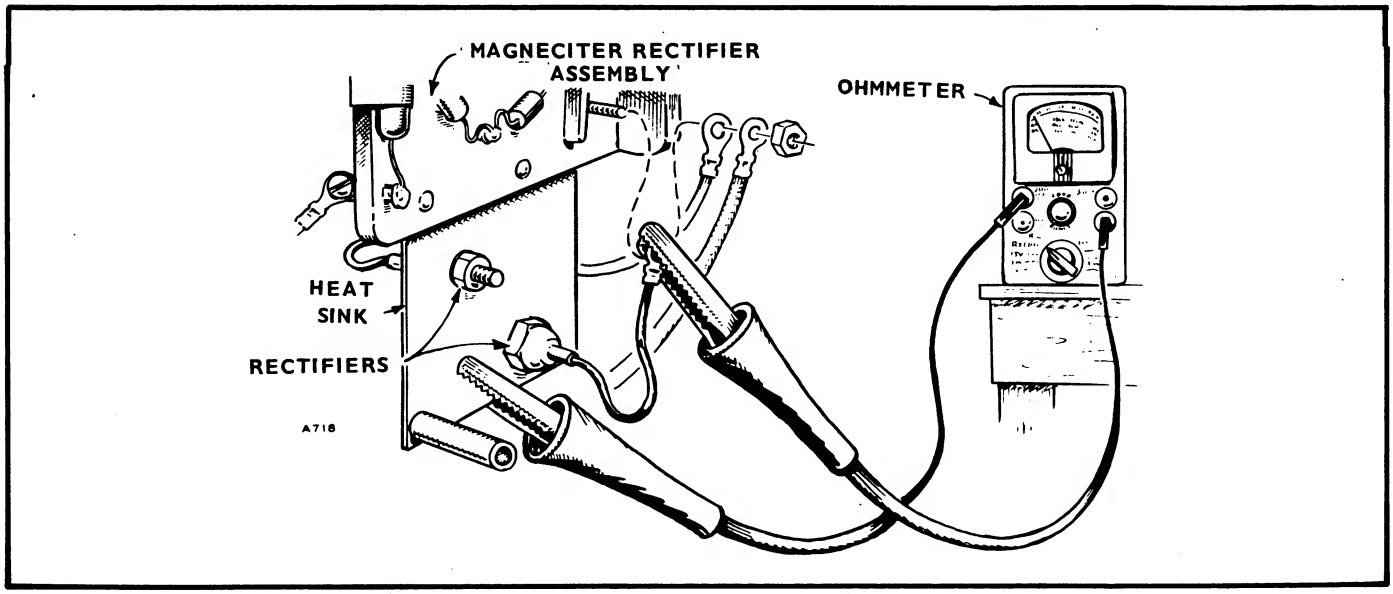


FIGURE 13. CHECKING RECTIFIERS

GENERATOR DISASSEMBLY

If generator tests determine generator repair is required, remove and disassemble the generator according to Figure 14 and the following instructions:

1. Disconnect generator and control leadwires from the terminal blocks in the control box. Check leadwire markings for legibility to ease assembly. Arrange leads so they can be withdrawn from the control box easily.
2. Remove the 4 cap nuts which attach the exciter cover and remove the cover. Disconnect the leadwires which come from the generator to the exciter (check leadwire markings for legibility). Remove the 6 cap screws which secure the exciter to the generator end bell and remove the entire exciter assembly.
3. Remove the centrifugal switch (item 8) from the end bell (13) and rotor shaft. Remove the end bell covers (items 9, 9A). Slip the brushes (item 7) and springs (item 6) from brush rig (item 5) – it is not necessary to disconnect the brush leads unless brush replacement is required.
4. Block the rear of the engine in place by supporting the flywheel housing. Remove the narrow generator band (item 14). Remove the large capscrews which secure the generator mounting pad (item 19) to the skid base. Remove the capscrews which secure the stator assembly (item 4) to the engine flywheel housing.
5. Using an overhead hoist and sling, slide the stator assembly (item 4) off the rotor assembly.

CAUTION *Do not damage the brush rig (item 5) while removing the stator.*

6. Remove the brush rig (item 5), large generator band (item 15) and the end bell (item 13) from the stator assembly (item 4) if required.
7. Attach the hoist and sling to the rotor assembly (item 1) and apply a slight lift to support the rotor. Remove the bolts which secure the flexible drive coupling to the engine flywheel and pull the rotor from the engine.
8. Pull the bearing (item 3) from the rotor shaft if required with a wheel or gear puller. If required, remove the blower (item 2) from the rotor and the air scroll (item 11). Refer to the Parts Catalog for replaceable parts and assemblies.

Generator assembly is the reverse of disassembly procedures.

Static exciter service and repair do not require complete disassembly. Individual components are easily accessible for servicing. All components are easily removable after disconnecting the attached leadwires. Refer to the Parts List for the exploded view and part numbers. See its Wiring Diagrams for leadwire connections.

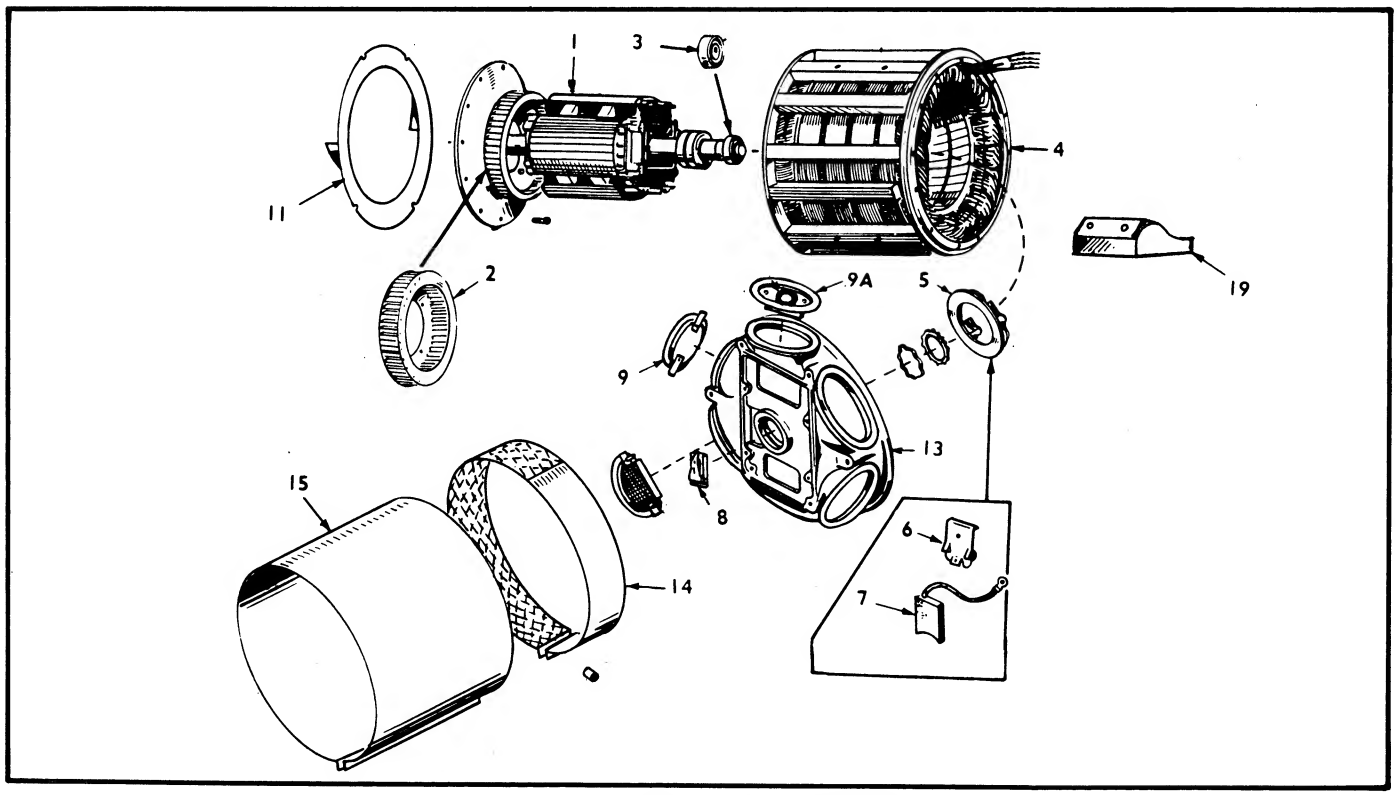


FIGURE 14. GENERATOR DISASSEMBLY

This catalog applies to the standard DEH plants as listed below. Powered by a Ford 242DF-6005-A engine (see Ford Manual). Engine parts modified or added by **Onan** will be in this list and have **Onan** part numbers. These supersede similar parts listed in the Ford manual. **Onan** parts are arranged in groups of related items and are identified by a reference. All parts illustrations are typical. Unless otherwise mentioned, parts are interchangeable. Right and left plant sides are determined by facing the front end of the engine.

PLANT DATA TABLE

MODEL AND SPEC NO. *		ELECTRICAL DATA				
HOUSED	UNHOUSED	WATTS	VOLTS	CYCLES	PHASE	WIRE
25DEH-53R/	25DEH-53R8/	25,000	120/240	50	1	3
25DEH-53UR/**	25DEH-53UR8/**	25,000	120/240	50	1	3
25DEH-54/	25DEH-54R8/	25,000	120/208	50	3	4
25DEH-54XR/	25DEH-54XR8/	25,000	277/480	50	3	4
25DEH-55DR/	25DEH-55DR8/	25,000	120/240	50	3	4
25DEH-57R/	25DEH-57R8/	25,000	220/380	50	3	4
25DEH-59R/	25DEH-59R8/	25,000	600	50	3	3
25DEH-59XR/	25DEH-59XR8/	25,000	347/600	50	3	4
30DEH-3R/	30DEH-3R8/	30,000	120/240	60	1	3
30DEH-3UR/**	30DEH-3UR8/**	30,000	120/240	60	1	3
30DEH-4R/	30DEH-4R8/	30,000	120/208	60	3	4
30DEH-4XR/	30DEH-4XR8/	30,000	277/480	60	3	4
30DEH-5DR/	30DEH-5DR8/	30,000	120/240	60	3	4
30DEH-9R	30DEH-9R8/	30,000	600	60	3	3
30DEH-9XR/	30DEH-9XR8/	30,000	347/600	60	3	4

* The Specification Letter advances (A to B, B to C, etc.) with manufacturing changes.
** U designates unity power factor.

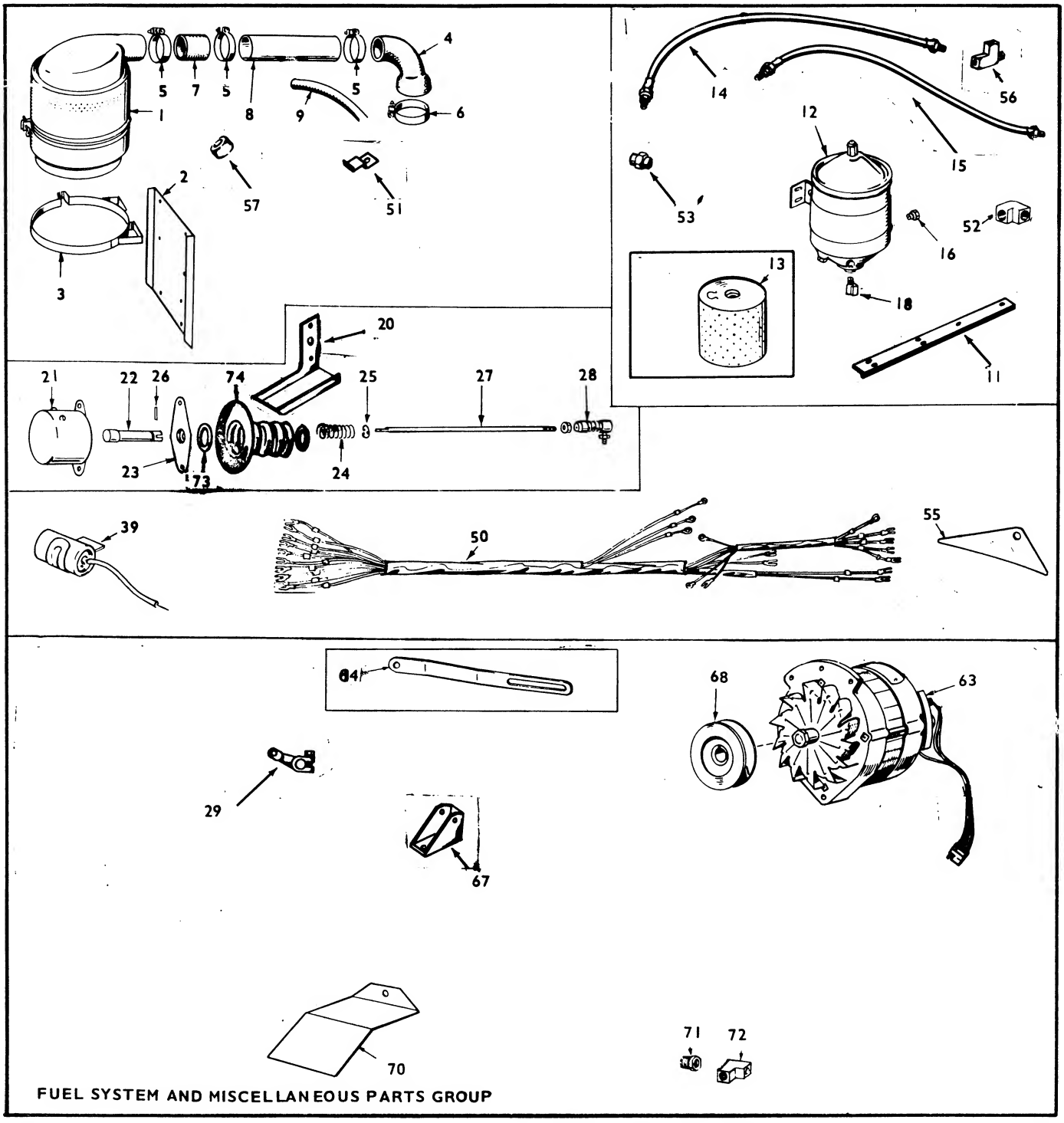
REPLACEMENT ENGINE:

100P704 1 Engine, Replacement (Ford Motor Company Model 2701E-242DF-6005-A).

General Description:

Includes - Complete Cylinder Block, Fuel Pump, Fuel Filter, Oil Filter, Starter Motor, Governor, Fan Blades (Pusher Type), Flywheel, Water Pump, Oil Pan, Oil Fill, Exhaust Manifold.

Excludes - Alternator, Alternator Mounting Brackets, Alternator Belt, Temperature Sender, Oil Pressure Sender.



FUEL SYSTEM AND MISCELLANEOUS PARTS GROUP

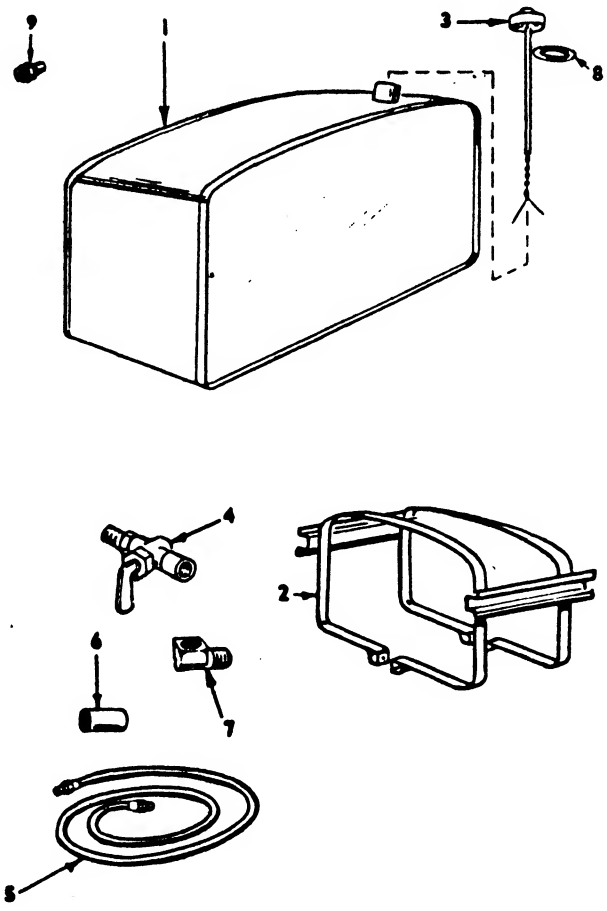
REF. NO.	PART NO.	QUANTITY USED	PARTS DESCRIPTION
1	140B62	1	Cleaner, Air
2	140B767	1	Bracket, Air Clnr. Mtg.
3	140A80	2	Band, Air Clnr. Mtg.
4	503B455	1	Hose, Air Clnr. Connector to Manifold
5	503-465	3	Clamp, Air Clnr. Hose
6	503-354	1	Clamp, Air Clnr. Hose
7	503A510	1	Hose, Air Clnr. To Connector
8	140A968	1	Connector, Air Clnr. to Manifold Hoses
9	503A545	1	Hose, Breather
11	149B1114	1	Bracket, Primary Fuel Filter Mtg.
12	149C1078	1	Filter, Fuel - Primary
13	149P846	1	Cartridge, Fuel Filter
14	501-4	1	Line, Fuel - Primary to Sec. Filter
15	501-3	1	Line, Fuel - Pump To Primary Filter
16	502-35	1	Connector, Primary Fuel Filter
18	502-41	1	Elbow, Primary Filter
20	306B214	1	Bracket, Sol. Mtg.
21	307B628	1	Solenoid, Stopping (12 V)
22	306A199	1	Plunger, Stop Solenoid
23	306A162	1	Retainer, Stop Sol. Plunger
24	306A198	1	Spring, Stop Sol. Plunger
25	518-203	1	Ring, Snap - Sprg. Ret.

REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
26	516P103	1	Pin, Roll - 1/8 x 1/2" - Sprg. Retg.
27	306A215	1	Rod, Stop Sol. to Joint
28	150A638	1	Joint, Rod to Inj. Pump
29	150A1139	1	Lever, Governor Stop
39	312A58	1	Condenser
50	338-378	1	Harness, Engine Cont.
51	140A970	1	Clip, Breather Tube
52	502-55	1	Elbow, Secondary Filter
53	502-51	1	Coupling
54	416A532	1	Cable, Starter Ground
55	191A516	1	Cover, Starter Motor Mtg. Hole
56	502-254	1	Tee, Fuel Ret.
57	403A315	2	Spacer, Air Clnr. Mtg. Brkt.

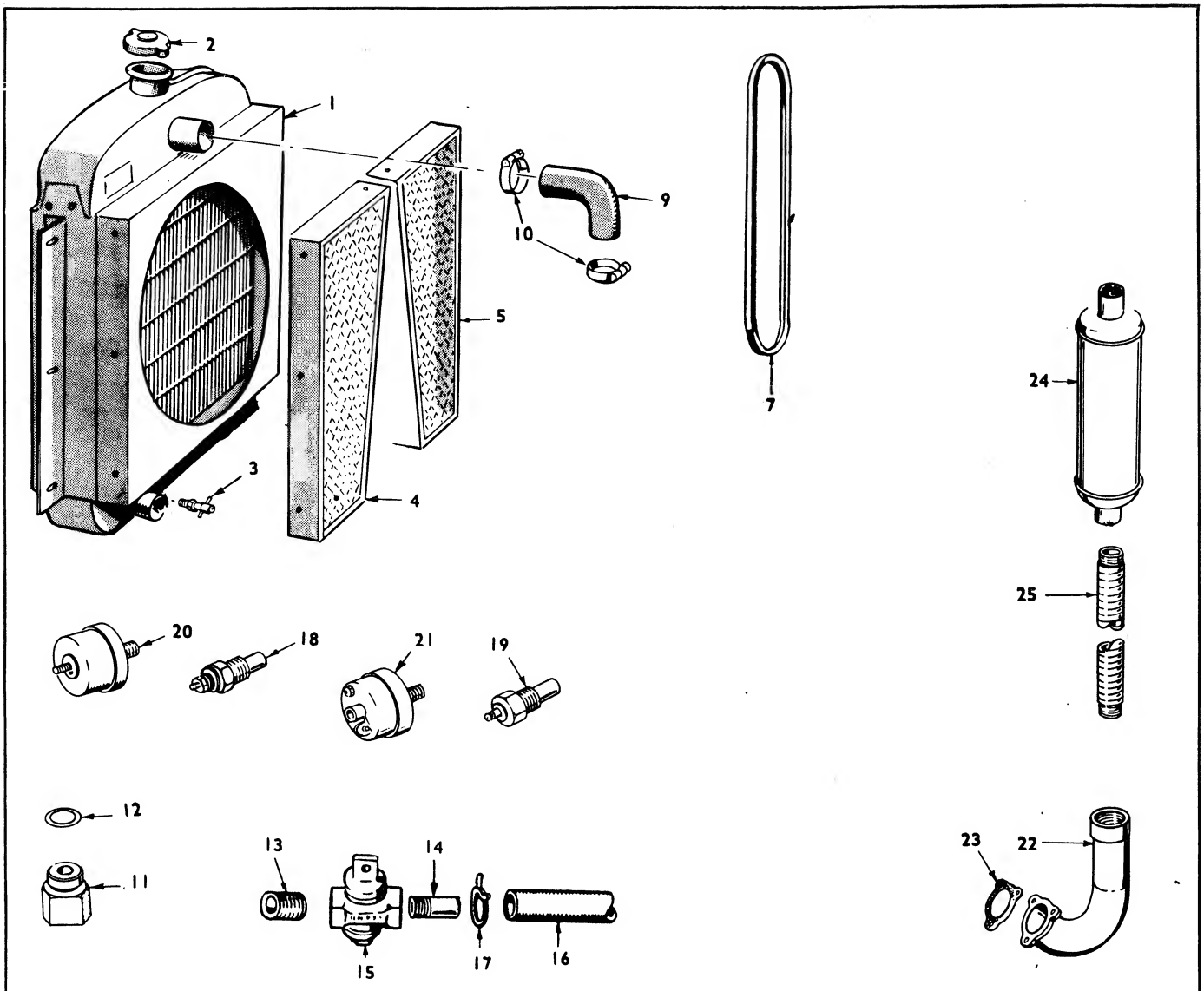
REF. NO.	PARTS NO.	QTY. USED	PARTS DESCRIPTION
63	191B665	1	*Alternator, Charge (Motorola #70D44039B)
64	191-101	1	Bracket, Alternator Adjusting
67	191B679	1	Bracket, Alternator Mounting
68	191-649	1	Pulley, Charge Alternator
70	191B619	1	Guard, Heat Shield
71	502-193	2	Connector, (1) Fuel Pump Inlet (1) Secondary Filter
72	502-5	1	Elbow, Fuel Pump Inlet
73	518-218	2	Ring, Retaining
74	306A193	1	Cover, Solenoid Plunger
	191-732	1	Regulator, Alternator

* For components, contact your nearest Motorola dealer or Motorola Automotive Products, Inc.
9401 W. Grand Ave.
Franklin Park, Illinois 60131

MOUNTED FUEL TANK GROUP (OPTIONAL EQUIPMENT)

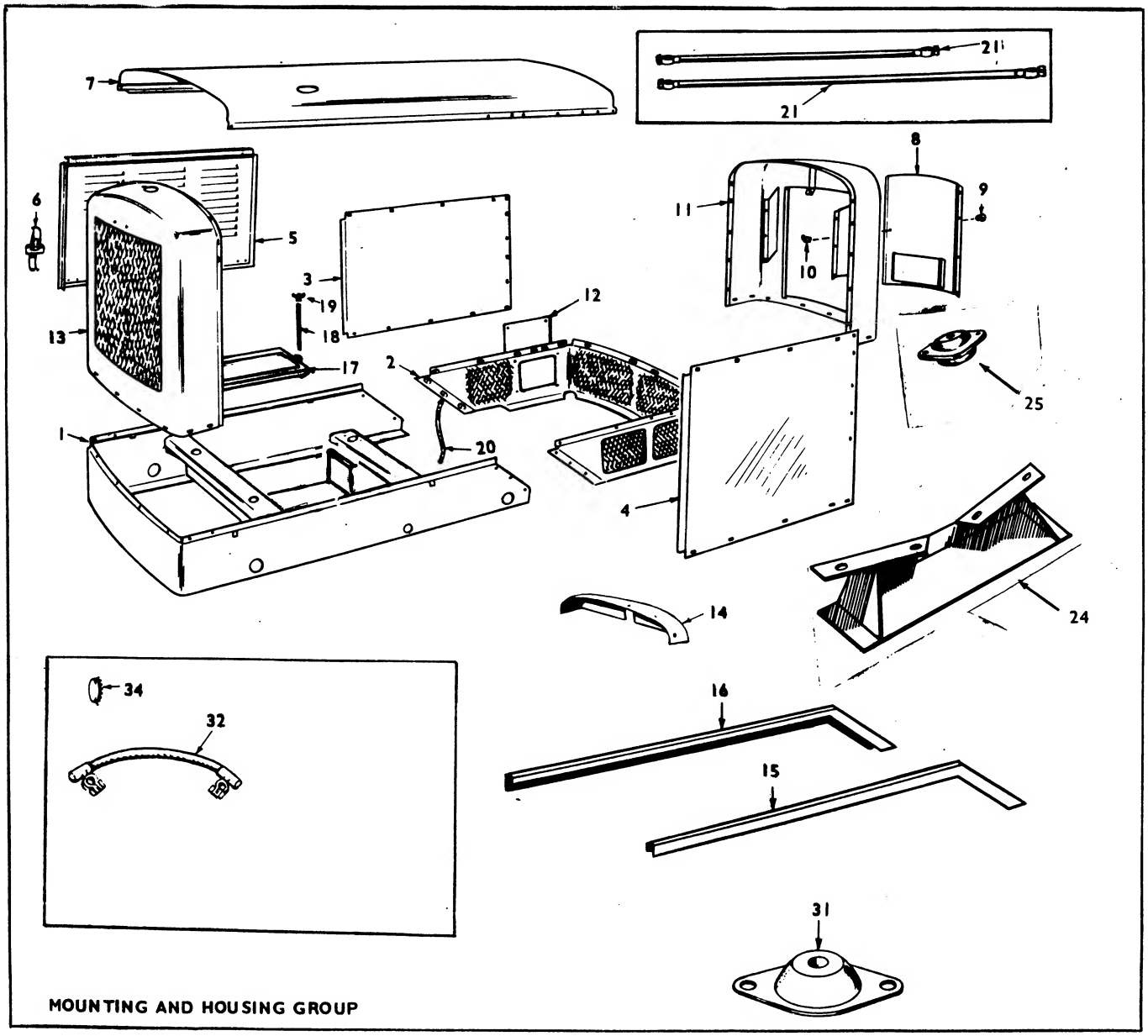


REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
1	159D490	1	Tank, Fuel
2	159D489	1	Strap Assy., Fuel Tank Mtg.
3	159D512	1	Cap & Ind., Fuel Tank
4	VALVE, SHUT-OFF		
	504-13	1	Fuel Supply - With Screen
	504A75	1	Fuel Supply --With Screen - Three-Way
	504-7	1	Fuel Return
	504-4	1	Fuel Return - Three-Way
5	LINE, FUEL		
	501A89	1	Fuel Supply (39")
	501A88	1	Fuel Return (28")
6	505-26	1	Coupling, Pipe 1/8"
7	502-20	1	Elbow, Street
8	159P751	1	Gasket, Gas Tank Filler Neck
9	502-3	1	Connector, Inv. Male (Use with Three-Way Valve)



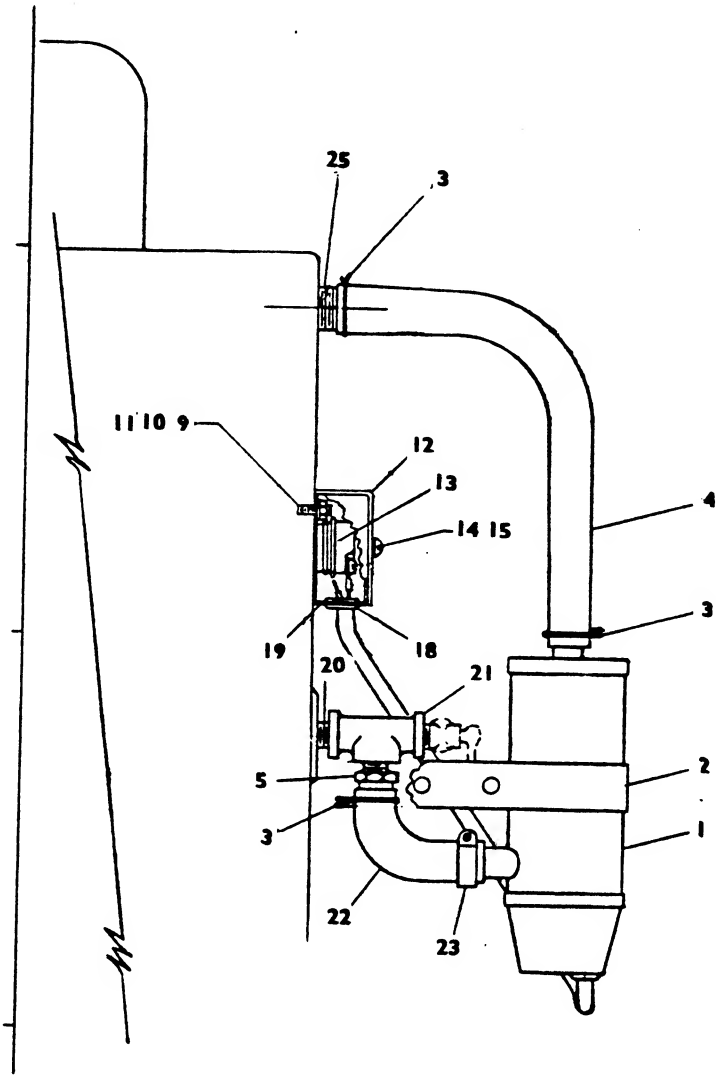
COOLING, OIL DRAIN AND EXHAUST GROUP

REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
1	130D712	1	Radiator
2	130B449	1	Cap, Radiator
3	504-28	1	Valve, Rad. Drain
4	130C352	1	Guard, Fan (R.H.)
5	130C351	1	Guard, Fan (L.H.)
7	511P79	1	Belt, Chg. Alt.
9	503A441	2	Hose, - Rad.
10	503P311	4	Clamp, Hose
11	102A619	1	Adapter, Oil Drain
12	102P532	1	Gasket, Oil Drain
13	505-224	1	Nipple, Pipe - Oil Drain
14	505A135	1	Nipple, Half, Oil Drain
15	504-30	1	Valve, Oil Drain
16	503-262	1	Hose, Oil Drain
17	503-131	1	Clamp, Hose - Oil Drain
18	193A104	1	Element, Water Temp.
19	309A179	1	Switch, Water Hi-Temp.
20	193A108	1	Element, Oil Pressure
21	309B10	1	Switch, Low Oil Pressure
22	155A863	1	Tube, Exhaust
23	185-112	1	Gasket, Exhaust Tube
24	155C917	1	Muffler
25	155A633	1	Tube, Exh. Flexible



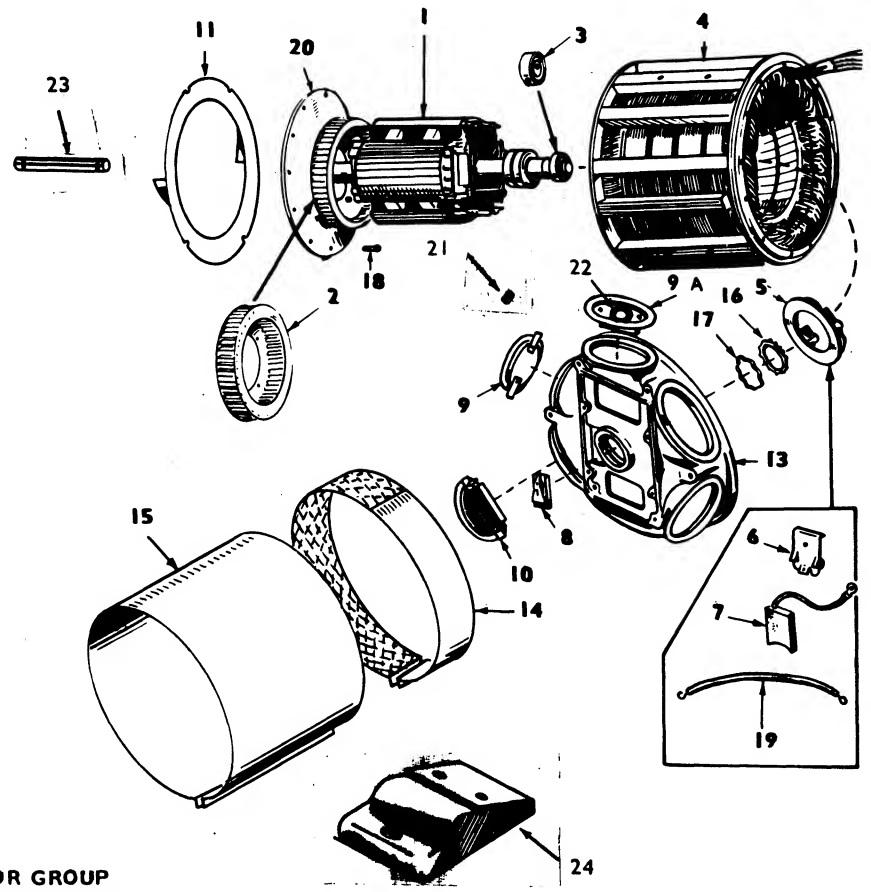
MOUNTING AND HOUSING GROUP

REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
1	403D813	1	Chassis, Front
2	403D697	1	Chassis, Rear (Housed)
3	405B931	1	Panel, Left Side (Housed)
4	405B930	1	Panel, Right Side (Housed)
5	405C934	2	Panel, Door Side (Housed)
6	406A105	4	Clamp, Door (Housed)
7	405D1377	1	Panel, Top (Housed)
8	405B932	1	Panel, Rear Door (Housed)
9	406-2	1	Knob, Door (Housed)
10	406A88	1	Catch, Door (Housed)
11	405D928	1	Panel, Rear (Housed)
12	403A373	1	Panel, Chassis (Housed)
13	405D1376	1	Panel, Front
14	405C1408	1	Extension Rad. Hood (Unhsd.)
15	403C700	1	Trim, Chassis - R.H. (Unhsd.)
16	403C701	1	Trim, Chassis - L.H. (Unhsd.)
17	416C480	1	Frame, Battery Hold-down
18	520A656	1	Stud, Battery Hold-down
19	865-7	1	Wing Nut, Battery Hold-down
20	336A1499	1	Cable, Ground
21	CABLE, BATTERY		
	416A530	1	16" Long
	416A531	1	24" Long
24	403C785	1	Support, Engine Mount
25	402P190	1	Mount, Front Engine
31	402A209	2	Mount, Vibration, Gen. End
32	416A446	1	Cable, Batt. (9")
34	517-19	2	Plug, Dot Button - Rad. Panel (Unhsd.)



WATER HEATER GROUP (OPTIONAL EQUIPMENT)

REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
1	333P52	1	Heater, Tank Type (1500 W.) Incl. Brkt. Hose Adapter & Cord
2		1	Clamp, Htr. Mtg. - NOT SOLD SEPARATELY (Incl. with tank assy.)
3	503-197	3	Clamp, Hose
4		As Req.	Hose (5/8" I.D. x 61/64" x 20") (Bulk #503P386)
5		1	Adapter, Hose - NOT SOLD SEPARATELY (Incl. with tank assy.
9	520A446	2	Stud, Therm. Box Mtg.
10	850-30	2	Lockwasher (#10), Therm. Box Mtg.
11	870-53	2	Nut, Hex (#10-32) - Therm. Box Mtg.
12	333A13	1	Cover, Therm. Mtg. Box
13	309P29	1	Thermostat, Heater Cont.
14	850-25	2	Lockwasher (#8), Therm. Box Cover
15	812-76	2	Screw, RHS (#8-32) Therm. Box Cover
18	508-8	1	Grommet, Therm. Box
19	333A12	1	Box, Therm. Mtg.
20	505-71	1	Nipple, Pipe (1/4 x 2")
21	505-184	1	Tee, Pipe (1/4")
22		As Req.	Hose (5/8" I.D. x 61/64" O.D. x 16") (Bulk #503P386)
23	503-183	1	Clamp, Hose (Lower Tank Fitting)
25	505-135	1	Nipple, Half - Pipe (3/8 x 1-1/2")

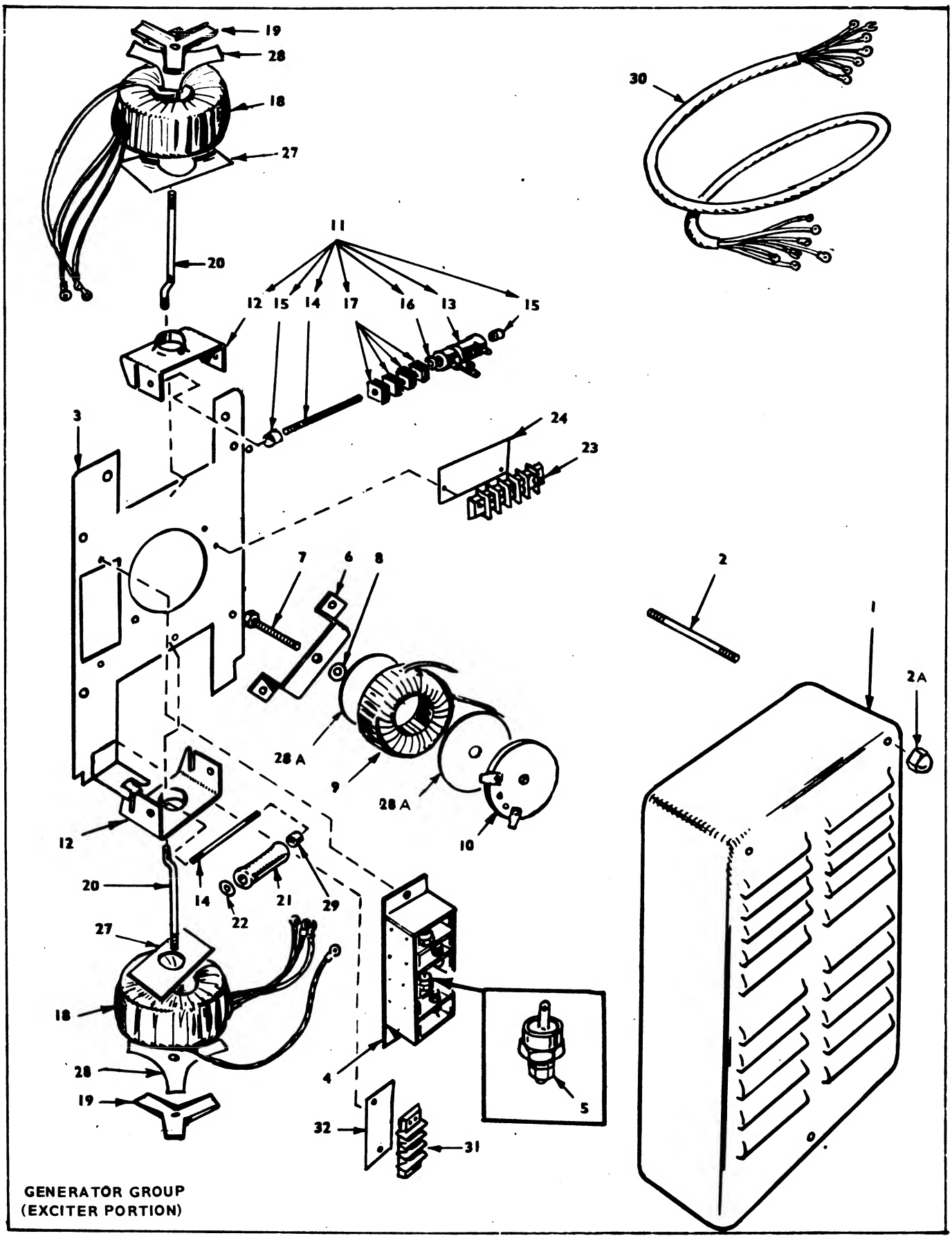


GENERATOR GROUP
(ALTERNATOR PORTION)

REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
1	*	1	Rotor Assy. Wound - Includes Brg. Blower & Drive Assy.
2	205B68	1	Blower
3	510P63	1	Bearing
4	*	1	Stator Assy. Wound
5	212C248	1	Rig Assy., Brush
6	212B1105	4	Spring, Brush
7	214A56	4	Brush
8	150A717	1	Switch Assy., Overspeed
9	232B1254	2	Cover, End Bell, Open. (Plain)
9A	234C226	1	Cover, End Bell Openings (W-Lead Hole) - Incl. Grommet
10	232B1253	2	Cover, End Bell Openings (Screened)

REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
11	234C175	1	Scroll, Air
13	211E131	1	Bell, End
14	234C174	1	Band, Gen. - Front (Narrow)
15	BAND, GENERATOR - REAR (Wide)		
	234C176	1	1-Phase Plants
	234C173	1	3-Phase Plants
16	232A1186	1	Holder, Brg. (Anti-Rotation)
17	232A1187	1	Spring, Brg. Holder
18	815A292	6	Bolt, Shoulder (5/16-18")
19	336A209	2	Jumper, Brush Rig
20	232B1820	1	Disc. Drive
21	232A1615	1	Spacer, Air Outlet Band
22	508-63	1	Grommet, End Bell Cover
23	232A1842	As Reg	Shim, Drive Disc
24	232C1556	2	Pad, Generator Mtg.

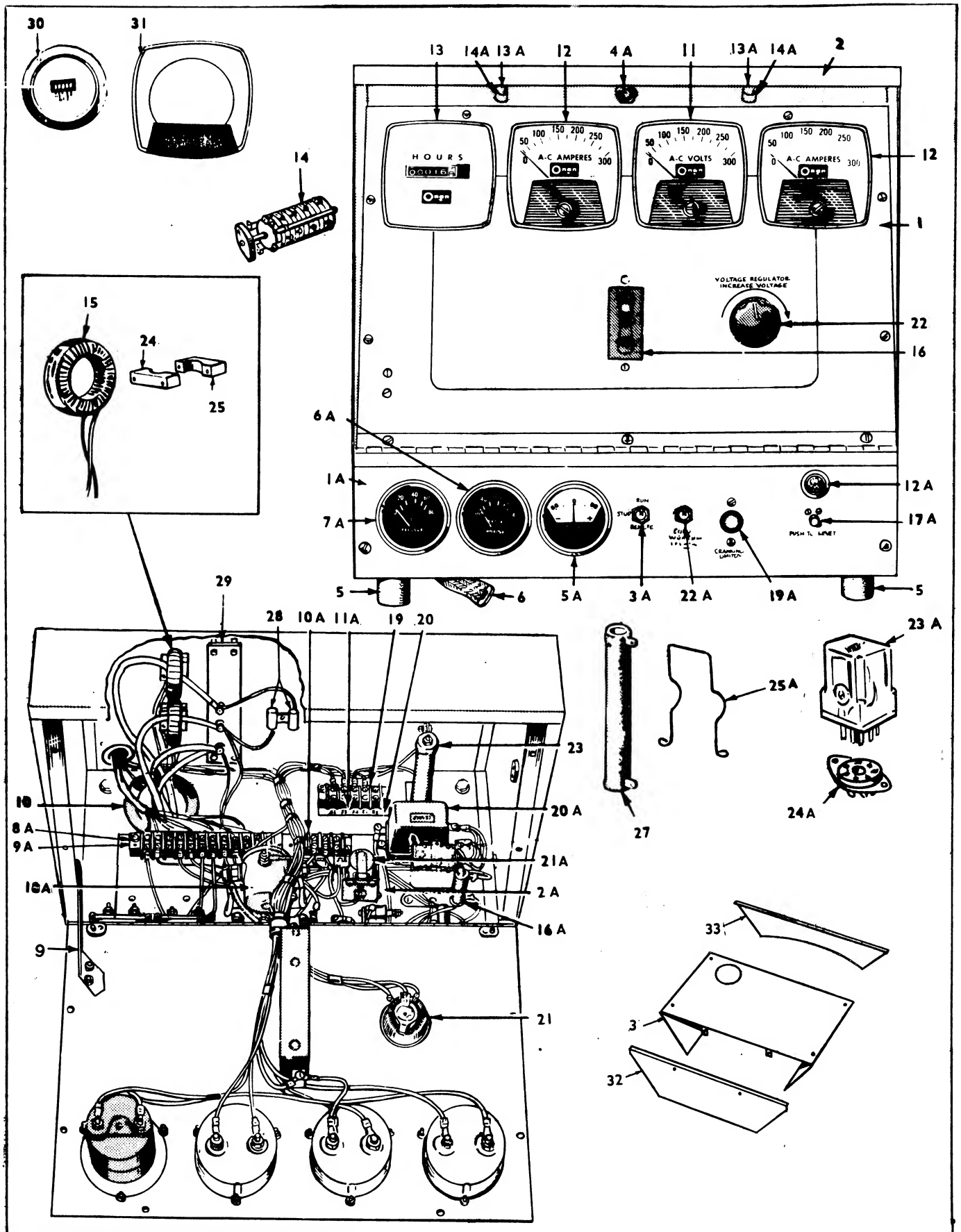
* - Order by description, giving complete Model and Serial Number (ONAN Nameplate).



GENERATOR GROUP
(EXCITER PORTION)

NOTE: Check Onan nameplate for correct Magneciter number. Select the part number column that applies to your plant.

REF. NO.	QTY. USED	PART DESCRIPTIONS	PART NUMBER 07SX1N1C	PART NUMBER 07SX5IN1C
	1	Exciter Complete (Less Cover)	209-16	209-19
1	1	Cover, Exciter	234D106	234D106
2	3	Stud, Exciter Cover Mtg.	520A575	520A575
2A	3	Nut, Exciter Cover Mtg.	866-1	866-1
3	1	Panel Only, Exciter	234D105	234D105
4	1	Rectifier Assy., Power	305B200	305B200
5	4	Rectifier Only, Power (Field)	305P239	305P239
6	1	Bracket Only, Overspeed Switch	150B733	150B733
7	1	Stud & Contact Point Assy., Voltage Control Reactor Mtg.	150A772	150A772
8	2	Fibre Washer (1/4 x 3/4 x 1/16")	508-18	508-18
8	1	Fibre Washer (1/4 x 3/8 x 1/32")	508-29	508-29
9	1	Reactor, Voltage Control	315A74	315B73
10	1	Block, Terminal –Volt. Cont. Reactor	332A687	332A687
11	1	Rectifier Assy., Includes Parts Marked*	305B202	305B202
12	2	*Bracket, Gate Reactor Mtg. (1 Only in 305B202)	234B60	234B60
13	1	*Resistor, Control, Adj. (150-Ohm, 25-Watt)	304A5	304A5
14	2	*Stud, Res. & Rect. Mtg. (1 Only in 305B202)	520A579	520A579
15	2	*Spacer, Res. & Rect. to Stud	232A1473	232A1473
16	2	*Washer, Adj. Resistor Centering	304A14	304A14
17	4	*Rectifier, Reg. Control	305P208	305P208
18	2	Reactor, Gate	315A47	315A59
19	2	Retainer, Gate Reactor	234B62	234B62
20	2	Stud, Gate Reactor Mtg.	232A1361	232A1361
21	1	Resistor, Fixed (200-Ohm, 50-Watt)	304A21	304A21
22	2	Washer, Fixed Res. Centering	304A15	304A15
23	1	Block, Term. (5-Place)	332A604	332A604
24	1	Strip, Blk. Marker (5-Place)	332A678	332A678
27	2	Insulation, Gate Reactor to Mtg. Bracket	232A1547	232A1547
28	2	Insulation, Gate Reactor to Retainer	232A1546	232A1546
28A	2	Insulation, Volt. Cont. Reactor Mtg.	232A1548	232A1548
29	2	Spacer, Fixed Resistor to Stud	232A1474	232A1474
30	1	Wiring Harness	338B237	338B237
31	1	Block, Term. (4-Place)	332A537	332A537
32	1	Strip, Marker	332A686	332A686



CONTROL GROUP (AC OUTPUT PORTION)

CONTROL GROUP (ENGINE INSTRUMENTS PORTION)

NOTE: Unhoused plants with optional Meter Panel, use parts marked (£) as listed for Housed Plants.

CONTROL GROUP (AC Output Portion)

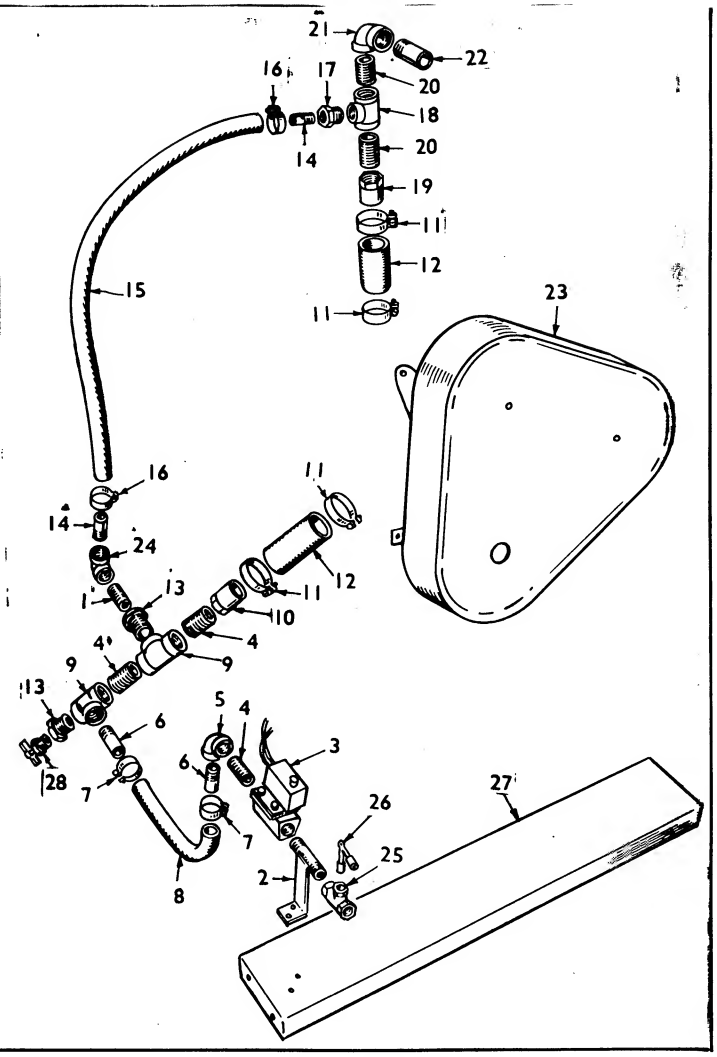
REF. NO.	PARTS NO.	QUANTITY USED	PARTS DESCRIPTION
1	£PANEL ONLY -UPPER CONTROL		
	301C1810	1	1-Phase - Housed Plants
	301C1814	1	3-Phase - Housed Plants
	301C1809	1	All Unhoused Plants
	301C1825	1	1-ph. Hsd. Plts. w/opt. Freq. Meter
	301C1815	1	3-ph. Hsd. plts. w/opt. Freq. Meter
2	301D2115	1	Box Only, Control
3	301B2984	1	Bracket, Cont. Box Mtg., Unhoused Plants
5	402-78	4	Mount, Rubber - Cont. Box Mtg. Unhoused Plants
6	337A44	1	Strap, Grd. - Unhoused Plants
9	301A1914	1	Bracket, Panel Stop
10	508-63	1	Grommet (For 2-3/4" Hole)
11	VOLTMETER, AC (Check Scale and Select According to Rating)		
	302P421	1	Voltmeter Scale 0-300
	302P422	1	Voltmeter Scale 0-600
	302P423	1	Voltmeter Scale 0-750
12	£AMMETER, AC - HOUSED PLANTS (Check Scale and Select According to Rating) NOTE: 1-Phase use 2.		
	302P405	1	Ammeter Scale 0-50
	302P406	1	Ammeter Scale 0-75
	302P408	1	Ammeter Scale 0-100
	302P410	1	Ammeter Scale 0-150
	302P411	1	Ammeter Scale 0-200
	302P412	1	Ammeter Scale 0-250
13	£METER, RUNNING TIME - HOUSED PLANTS		
			60-Cycle Plants
	302P465	1	120/240-V, 1-Ph., 120-208-V, 3-Ph., 120/240-V, 3-Ph. & 600-V, 3-Ph.
	302P466	1	220/380-V, 3-ph
	302P467	1	277/480-V, 3-Ph
			50-Cycle Plants
	302P468	1	120/240-V, 1-Ph., 120/208-V 3-Ph., 120/240-V 3-Ph. & 600-V 3-Ph
	302P469	1	220/380-V 3-Ph.
	302P470	1	277/480-V 3-Ph.
14	308-22	1	Switch, Volt. & Current Sel., Housed Plants, 3-Ph.
15	£TRANSFORMER, CURRENT, HOUSED PLANTS, (Check Transformer Nameplate, Select According to Rating)		
	302B117	3	Nameplate Ratio 50/5 (Use with 0-50 AC Ammeter)
	302B76	3	Nameplate Ratio 75/5 (Use with 0-75 AC Ammeter)
	302B78	3	Nameplate Ratio 100/5 (Use with 0-100 AC Ammeter)
	302B79	3	Nameplate Ratio 150/5 (Use with 0-150 AC Ammeter
	302B106	2	Nameplate Ratio 200/5 (Use with 0-200 AC Ammeter) 2 Only for 1-Ph.)
16	320B17	1	Breaker, Circuit
19	332A604	1	Block, Term. (5-Place)
20	STRIP, TERMINAL BLOCK MARKER		
	332A689	1	Marked 32, 33, 34, E1, E2, For 120/240-V 1-Ph., 120/208-V 3-Ph. & 120/240-V 3-Ph.
	332A690	1	Marked 32, 33, 34, 35, 36. For 277/480-V 3-Ph., 220/380V 3-Ph. & 600-V 3-Ph.
21	303-97	1	Rheostat, Volt. Reg.
22	303-32	1	Knob, Rheostat
23	304A479	1	Resistor, Volt. Reg.
24	302A235	3	£Clamp, Current Trans. Mtg., Inside Half (Note: Use 2 for 1-Ph.) Housed Plants
25	302A236	3	£Clamp, Current Trans. Mtg., Outside Half (Note: Use 2 for 1-Ph.) Housed Plants
27	304A536	1	£Resistor, Fixed (9000-Ohm, 50-Watt) Off Running Time Meter, 600-V 3-Ph., Hsd. Plts.
28	CONDENSER, OUTPUT TERMINAL SUPPRESSION		
	312A58	2	120/240-V 1-Ph.
	312A58	3	120/208-V 3-Ph.
	312A58	4	120/240-V 3-Ph
	312A145	3	277/480-V & 220/380-V, 3-Ph.
29	332A513	1	Block, Term., Output
30	METER, FREQUENCY - OPTIONAL		
	302-213	1	60-Cycle
	302-234	1	50-Cycle
31	302B448	1	Plate, Meter Face - Opt.
32	301B2985	1	Cover, Lead - Generator End
33	301B2986	1	Cover, Lead - Engine End

CONTROL GROUP (Engine Instruments Portion)

1A	301C2124	1	Panel Only, Lower Cont.
2A	301A1685	1	Bracket, Time Delay Relay Mounting
3A	308P138	1	Switch (Run-Stop-Remote)
4A	308-2	1	Switch, Panel Light
5A	302A61	1	Ammeter, Charge (30-0-30)
6A	193B106	1	Gage, Water Temp.
7A	193B107	1	Gage, Oil Pressure
8A	332A607	1	Block, Term. (12-Place)
9A	332A608	1	Strip, Marker (4 through 15)
10A	332A611	1	Block, Term. (3-Place)
11A	332A762	1	Strip, Marker (Remote, B+, Ground)
12A	322P69	1	Receptacle Assy., Pilot Light
13A	322P72	2	Receptacle, Panel Light
14A	322-4	3	Bulb, (2) Panel (1) Pilot
16A	304A192	1	Resistor, Fixed (3-Ohm, 10-W)
17A	307A655	1	Relay, Emergency Latch
18A	307B514	1	Relay, Starter Pilot (Mdls. w/opt. Manifold Htr. use 2)
19A	320A104	1	Limiter, Cranking
20A	307B597	1	Relay, Fuel Solenoid
21A	307A388	1	Relay, Time Delay, Low Oil Pressure Switch
22A	308-37	1	Switch, Manifold Heater (Opt.)
23A	307P819	1	Relay, Start, Disc.
24A	323P52	1	Socket, Relay
25A	307P778	1	Spring, Start-Disc. Relay Hold-down

CITY WATER COOLING GROUP (Without Heat Exchanger and Water Cooled Manifold) - **OPTIONAL EQUIPMENT** (Unhoused Plants)

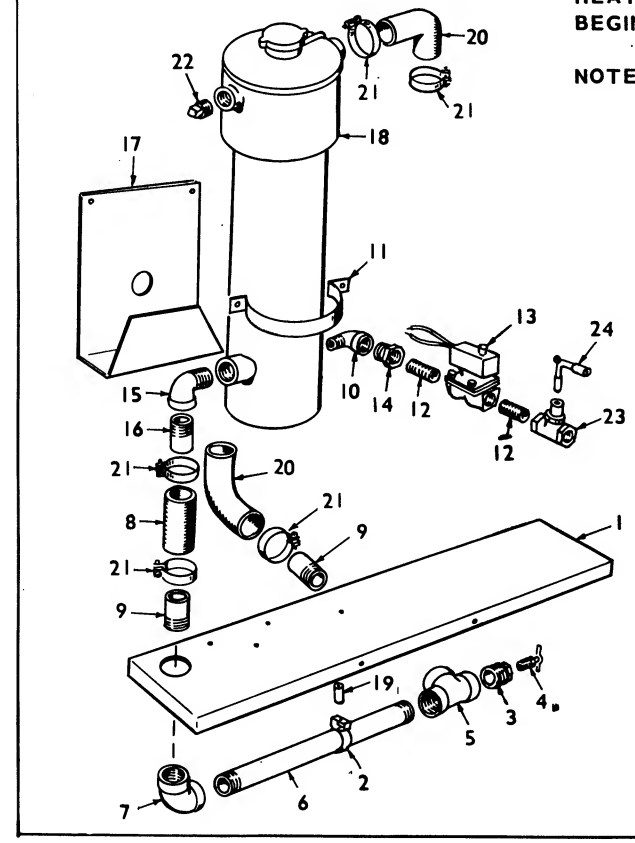
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	505-99	1	Nipple, Close (1/4″)
2	110A526	1	Nipple & Bracket Assembly
3	307-833	1	Valve, Water
4	505-100	3	Nipple, Pipe-Close (1/2″)
5	505-40	1	Elbow, Pipe (1/2″ x 90°)
6	505A185	2	Nipple, Half (1/2 x 1-1/2″)
7	503-189	2	Clamp, Hose
8		1	Hose (11″ Piece of Bulk Hose #503P191)
9	505-108	2	Tee (1/2″)
10	110A576	1	Adapter
11	503-365	4	Clamp, Hose
12		2	Hose (3″ Piece of Bulk Hose #503-356)
13	505-18	2	Bushing, Pipe-Reducer (1/2 x 1/4″)
14	505-10	2	Nipple, Half (1/4 x 1″)
15		1	Hose (30″ Piece of Bulk Hose #503P110)
16	503P32	2	Clamp, Hose
17	505-20	1	Bushing, Reducer (3/4 x 1/4″)
18	505-166	1	Tee, Pipe (3/4″)
19	110A1543	1	Adapter
20	505-102	2	Nipple, Pipe-Close (3/4″)
21	505-132	1	Elbow, Pipe (3/4 x 90°)
22	505A324	1	Nipple, Half (3/4 x 2″)
23	130D720	1	Guard, Belt (Unhoused Plants)
24	505-38	1	Elbow, (1/4 x 90°)
25	504-19	1	Valve, Lockshield
26	504-20	1	Key, Lockshield Valve
27	130C499	1	Bracket
28	504-3	1	Valve, Drain

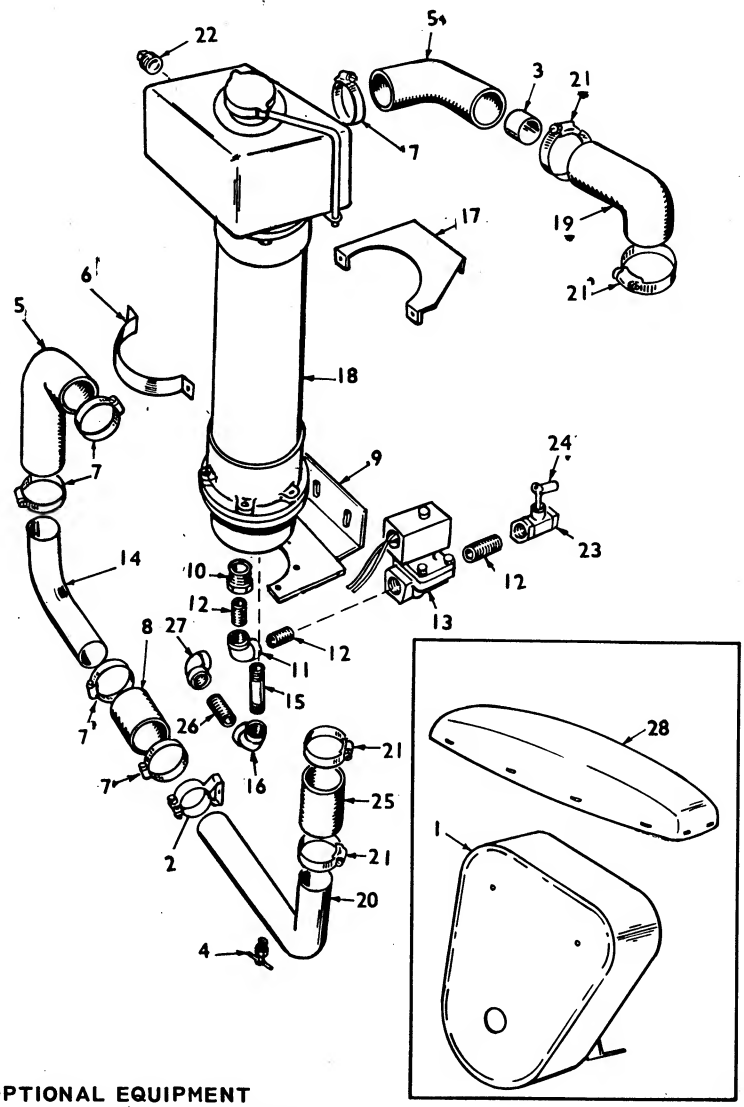


HEAT EXCHANGER GROUP - OPTIONAL EQUIPMENT (Unhoused Plants) **BEGIN ONAN SERIAL NUMBER 895419**

NOTE: See separate group prior to Onan serial number 895419.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130B805	1	Base, Heat Exchanger Mounting
2	331P101	1	Bracket, Nipple
3	505-426	1	Bushing, Reducer (1-1/2 x 1-1/4″) 1-1/4″)
4	504-3	1	Valve, Drain
5	505-317	1	Tee, Pipe (1-1/2″)
6	505A424	1	Nipple, Half (1-1/2 x 16-1/2″)
7	505-43	1	Elbow (1-1/2 x 90°)
8		1	Hose (4″ Piece of Bulk Hose #503-356)
9	505-628	2	Nipple, Half (1-1/2 x 3″)
10	505-691	1	Elbow, Street (3/4″ x 45°)
11	130A802	1	Strap, Heat Exchanger Mounting
12	505-100	2	Nipple, Pipe- Close (1/2″)
13	307A833	1	Valve, Water
14	505-21	1	Bushing, Reducer (3/4 x 1/2″)
15	505-462	1	Elbow, Street (1-1/2″ x 90°)
16	505-444	1	Nipple, Half(1-1/2 x 2-1/4″)
17	130C803	1	Support, Heat Exchanger
18	130C796	1	Exchanger, Heat
19	232A1197	1	Spacer, Heat Exchanger Mounting
20	503A441	2	Hose
21	503P311	6	Clamp, Hose
22	505-140	1	Plug, Pipe (1″)
23	504-19	1	Valve, Lockshield
24	504-52	1	Key, Lockshield Valve



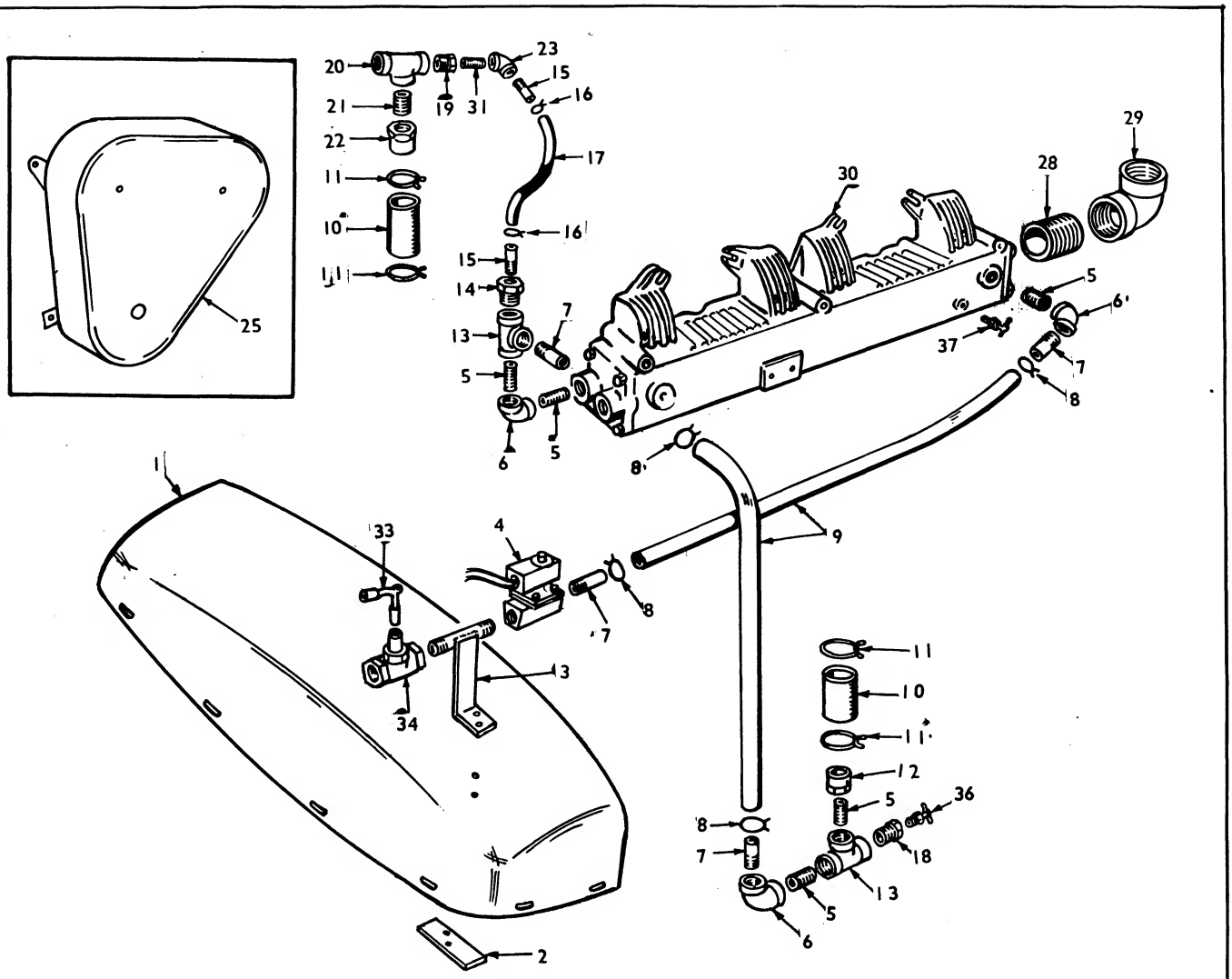


HEAT EXCHANGER GROUP - OPTIONAL EQUIPMENT
(Unhoused Plants) - PRIOR TO ONAN SERIAL NUMBER 895419

NOTE: See separate group beginning Serial Number 895419.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130D720	1	Guard, Belt
2	331P101	1	Bracket
3	130-508	1	Tube, Hose Connector
4	504-5	1	Valve, Drain
5	503-553	2	Hose, Elbow
6	130A722	1	Clamp, Heat Exchanger Mounting
7	503P4	5	Clamp, Hose
8	503A3	1	Hose
9	130C715	1	Bracket, Heat Exchanger Mtg.
10	505-22	1	Bushing, Reducer (1 x 1/2″)
11	505-40	1	Elbow, Pipe (1/2″ x 90°)
12	505-100	3	Nipple, Pipe-Close (1/2″)
13	307A833	1	Valve, Water
14	130A349	1	Tube, Elbow
15	505-87	1	Nipple, Pipe (1 x 3″)

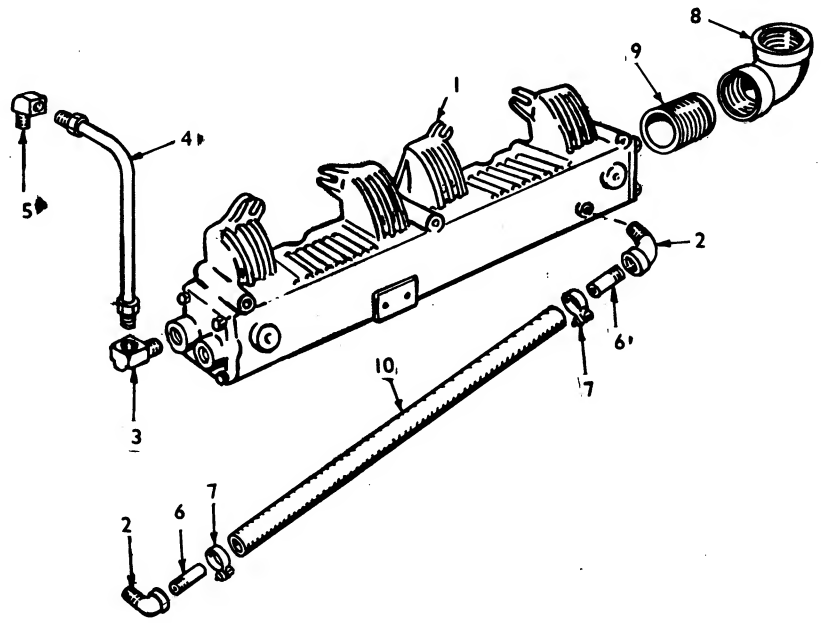
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
16	505A657	1	Elbow (3/4″ x 90°)
17	130A721	1	Bracket, Heat Exchanger Mtg.
18	130C505	1	Exchanger, Heat
19	503-554	1	Hose, Elbow
20	130A724	1	Tube, Elbow (With Provision for Drain)
21	503P365	4	Clamp, Hose
22	505-130	1	Plug, Pipe (3/4″)
23	504-19	1	Valve, Lockshield
24	504-20	1	Key, Lockshield Valve
25	503-552	1	Hose
26	505-102	1	Nipple, Close (3/4″)
27	505-132	1	Elbow (3/4″ x 90°)
28	403C384	1	Cover, Chassis



CITY WATER COOLING GROUP (With Water Cooled Manifold) (Unhoused Plants) **OPTIONAL EQUIPMENT**

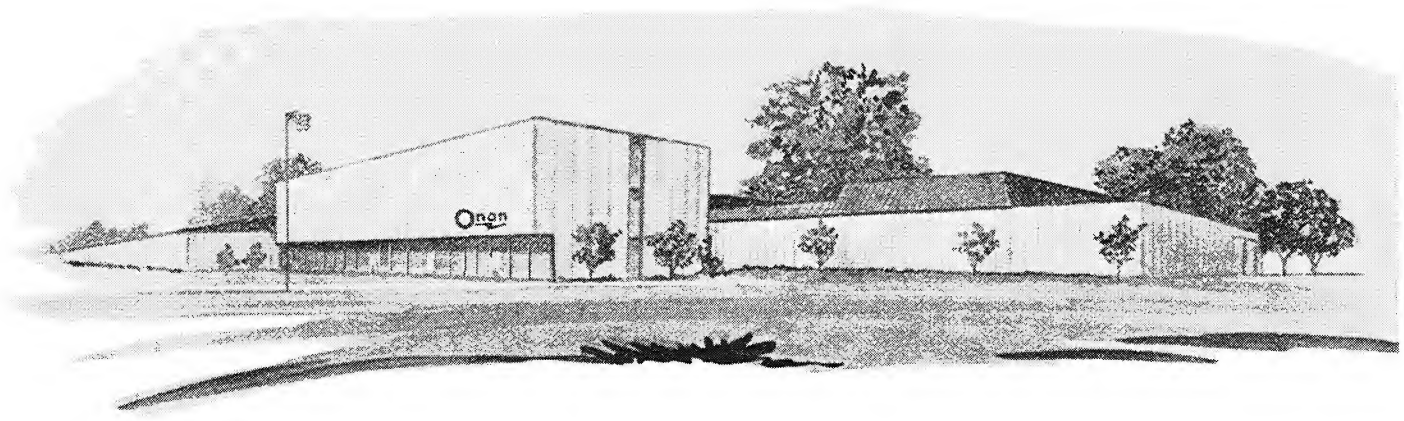
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403C384	1	Cover, Chassis
2	154A525	1	Backplate
3	110A526	1	Nipple & Bracket
4	307A833	1	Valve, Water
5	505-100	5	Nipple, Pipe-Close (1/2″)
6	505-40	3	Elbow, Pipe (1/2 x 90°)
7	505A185	4	Nipple, Half (1/2 x 1-1/2″)
8	503-189	4	Clamp, Hose
9		As Req.	Hose (50″ Piece of Bulk Hose #503-386)
10		2	Hose (3″ Piece of Bulk Hose #503-356)
11	503-311	4	Clamp, Hose
12	110A576	1	Adapter
13	505-108	2	Tee, Pipe (1/2″)
14	505-18	1	Bushing, Reducer (1/2 x 3/8″)
15	505A302	2	Nipple, Half (1/4 x 1″)
16	503-183	2	Clamp, Hose

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
17		1	Hose (12″ Piece of Bulk Hose #503P110)
18	505-19	1	Bushing, Reducer (1/2 x 3/8″)
19	505-20	1	Bushing, Reducer (3/4 x 1/4″)
20	505-166	1	Tee, Pipe (3/4″)
21	505-102	1	Nipple, Pipe-Close (3/4″)
22	110A1543	1	Adapter
23	505-38	1	Elbow (1/4″)
25	130C720	1	Guard, Belt
28	505-172	1	Nipple, Close (1-1/2″)
29	505-175	1	Elbow (1-1/2″ x 90°)
30	154P888	1	Manifold, Water Cooled
31	505-99	1	Nipple, Pipe-Close (1/4″)
33	504-20	1	Key, Lockshield
34	504-19	1	Valve, Lockshield
36	504-28	1	Valve, Drain
37	504-5	1	Valve, Drain



WATER COOLED MANIFOLD GROUP - OPTIONAL EQUIPMENT

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	154P888	1	Manifold, Water Cooled
2	505-120	2	Elbow, Street (3/8″ x 90°)
3	502-73	1	Elbow (1/2″ x 90°)
4	130A674	1	Line, Water - Front
5	502-74	1	Elbow, Street (1/2″ x 90°)
6	505-135	2	Nipple, Half (3/8 x 1-1/2″)
7	503P183	2	Clamp, Hose
8	505-175	1	Elbow, Exhaust
9	505-172	1	Nipple, Exhaust
10		1	Hose (30″ Piece of Bulk Hose #503-386)



ONAN **1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432**
A DIVISION OF ONAN CORPORATION

ONAN PRESS PUBLICATION